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DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE GREEN MOUNTAIN MINING VENTURE
JACKPOT MINE PROJECT
FREMONT AND SWEETWATER COUNTIES, WYOMING

Prepared for

Lander Resource Area
Rawlins District
Bureau of Land Management
Rawlins, Wyoming

By

Mariah Associates, Inc.
Laramie, Wyoming
MAI Project 1007

June 1995

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DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE GREEN MOUNTAIN MINING VENTURE JACKPOT MINE PROJECT FREMONT AND SWEETWATER COUNTIES, WYOMING

(X) Draft ( ) Final

U.S. Department of the Interior
Bureau of Land Management

Abstract:

This Draft Environmental Impact Statement assesses the environmental consequences of a proposed uranium mine project in Fremont and Sweetwater Counties, approximately 14 miles southeast of Jeffrey City, Wyoming. Public scoping commenced in April 1993 and comments were accepted until January 1994. All issues raised during scoping and interdisciplinary team preparation of the analysis are addressed. The proposed project entails the construction, operation, and reclamation of an underground uranium mine and associated facilities (e.g., roads) by the Green Mountain Mining Venture. A transportation corridor connecting the proposed mine with the Sweetwater Uranium Mill, approximately 27 miles to the south, would involve the construction of a new transportation route and/or upgrade of existing roads. The proposed project would use standard procedures as currently employed by other underground mining projects, plus additional project-specific and site-specific mitigation measures to ensure that project impacts are minimized on all important resources. Impacts to most resources would be negligible to moderate during the life-of-project. Potentially significant impacts resulting from the project include: fugitive dust emissions along project-required roads; the diversion of No Name Creek; the location of the mine waste rock pile in the No Name Creek Drainage; the temporary preclusion of oil and gas development on areas above the proposed mine; the reactivation of stabilized sand dunes; and the degradation of prehistoric Site 48FR479 and/or the Rawlins-Fort Washakie Stage Road. The proposed project could also have numerous beneficial impacts including increased revenues generated by taxes and increased regional employment opportunities.

EIS Contact:

Comments on this EIS should be directed to:
Larry Kmoch
Rawlins District Office
Bureau of Land Management
P.O. Box 670
Rawlins, Wyoming 82301

For further information contact Larry Kmoch at the Rawlins District Office, (307) 324-7171.
Date Draft EIS made available to EPA and Public: June 22, 1995.

MARCH 3, 1849

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:
1793 (934)

JUN 14 1995

Dear Reviewer:

This Draft Environmental Impact Statement (DEIS) on the proposed Jackpot Mine Project is submitted for your review and comment. This DEIS has been prepared to analyze the potential impacts from an underground uranium mine proposed by the Green Mountain Mining Venture (GMMV) for the southern side of Green Mountain, 14 miles southeast of Jeffrey City, Wyoming.

The public comment period for this DEIS will close 60 days after the Environmental Protection Agency publishes their Notice of Availability of the DEIS in the Federal Register. Date of publication is expected to be June 23, 1995. If you wish to comment on the DEIS, we request that you make your comments as specific as possible and identify the chapter, page, and paragraph to which the comments pertain.

Public meetings to obtain additional comment on the Jackpot Mine DEIS are scheduled as follows:

July 18, 1995--School District 25 Central Administration Building public meeting room, Riverton, Wyoming--7 p.m.

July 19, 1995--Fire Hall, Jeffrey City, Wyoming--7 p.m.

July 20, 1995--BLM District Office, Rawlins, Wyoming--7 p.m.

July 24, 1995--White Mountain Library public meeting room, Rock Springs, Wyoming--7 p.m.

This DEIS was prepared pursuant to the National Environmental Policy Act (NEPA), and other regulations and statutes, to address possible environmental and socioeconomic impacts which could result from the project and to solicit public comments and concerns. This DEIS is not a decision document. Its purpose is to inform the public of the impacts associated with implementing GMMV's proposal and to evaluate alternatives to the proposal.

Please address comments on this DEIS or requests for additional copies to:

Bureau of Land Management
Rawlins District Office
Attn: Larry Kmoch
P.O. Box 670
Rawlins, WY 82301

Sincerely,

Alan R. Pierson
State Director

EXECUTIVE SUMMARY

This Draft Environmental Impact Statement was prepared in accordance with the National Environmental Policy Act of 1969 to assess the environmental consequences of a proposed uranium mine project in the Green Mountain area of southeastern Fremont and northeastern Sweetwater Counties, Wyoming. Public scoping was conducted with scoping statements mailed to potentially interested parties and the media in January and November 1993. All issues identified during scoping and by a Bureau of Land Management Interdisciplinary Team review are addressed. The proposed project is in conformance with the BLM Lander and Great Divide Resource Area Resource Management Plans, and the State of Wyoming, Fremont County, and Sweetwater County Land Use Plans.

The proposed project is to explore for and develop uranium reserves present in the Battle Springs Formation at depths of approximately 2,500 to 3,500 feet below the surface of Green Mountain. Project-required lands encompass a maximum of 515 acres within portions of Townships 24 through 28 North, Ranges 91 through 93 West.

The proposed project involves the development of an underground uranium mine on approximately 42 acres within a Wyoming Department of Environmental Quality, Land Quality Division authorized permit area. Standard procedures as currently used in underground uranium mine developments throughout Wyoming and the surrounding region would be employed during project development. Activities conducted during project development, operation, and abandonment would comply with all applicable federal, state, and county laws, regulations, and stipulations. Uranium ore from the project would be transported from the mine site along upgraded and/or newly constructed roads linking the mine site with the existing Sweetwater Uranium Mill to the south.

The proposed project would initially disturb from 289 to 387 acres from mine site development (118 acres) and roads (117 to 269 acres). From 130 to 404 acres of existing disturbance areas at the Jackpot and Big Eagle Mine sites (30 to 127 acres) and along existing roads (100 to 277 acres) would be used for the project.

It is anticipated that underground uranium exploration and mine development would require from two to seven years, and the proposed life-of-project would require from 13 to 25 years. Mining and ore transport activities would be conducted on a 24-hour basis and require 3 crews. As many as 250 workers would be required during mining operations. Areas disturbed during road improvement and construction operations that are not required for the life-of-project would be reclaimed as soon as practical. When uranium reserves have been depleted, the mine portals would be plugged and the ground surface recontoured and reclaimed to blend with the natural landscape. Also, surface structures would be removed, roads closed per landowner or BLM request, and disturbed areas reclaimed.

Four transportation alternatives, one mine waste rock disposal alternative, and the No Action Alternative are considered in this Environmental Impact Statement. Additional alternatives requiring alternate exploration procedures, mining methods, and mine development schedules were considered but rejected for environmental and/or economic reasons. The BLM preferred alternative for this project includes approval of the Plan of Operations for the underground mine (the Proposed Action) and disposal of mine waste rock at the Big Eagle Mine (Alternative D). A combination of the upgrading of existing roads (the Proposed Action) and construction of new haul road segments (Alternatives B and C) are selected as the preferred access/haul road. These roads would be subject to modifications in alignment necessary to minimize or avoid adverse impacts to riparian and cultural (both prehistoric and historic) resources. The modifications would also be based on considerations such as using existing disturbed areas where practical, landowner negotiations on non-federal lands, and a road design engineered to address safety, soil limitations, slope drainage, and the points of intersection with the Crooks Gap Wamsutter Road. All of the above factors would be utilized to select the final alignment.

The proposed project area has a continental, semi-arid, cold desert climate and lies primarily within portions of the Great Divide Basin. The mine site and northern portions of access and haul roads are located on the southern flanks of Green Mountain, and drainage from these areas is to Crooks Creek. Intermittent and ephemeral drainages along southern portions of the transportation corridors flow southwest to the Great Divide Basin. Groundwater and surface water are variable in quality, and the major current use is for livestock and recreation.

Project area soils have high rates of natural erosion, and plant cover values and productivity are variable. Vegetation is primarily a grassland/shrubland mosaic comprised of big sagebrush (*Artemisia tridentata*), upland grasses, saltbush (*Atriplex* spp.), and greasewood (*Sarcobatus vermiculatus*) scattered with barren areas associated with cliffs, badlands, and rock outcrops. Some trees occur along the southern flanks of Green Mountain. Range condition is generally good. Wetlands in the project area are restricted to drainage bottoms, around impoundments, and adjacent to Crooks Creek.

Elk, moose, pronghorn antelope, and mule deer are the big game species most commonly occurring on the area. Sage grouse leks and raptor nest areas occur adjacent to project-required lands, and monitoring would be conducted to determine the activity status of sage grouse leks and raptor nests proximal to proposed developments. Threatened and endangered species that may occur on the area include black-footed ferret, bald eagle, and peregrine falcon. The mountain plover, a Category 1 species for threatened and endangered listing, potentially occurs in the area.

Livestock grazing, wildlife habitat, and recreation are the predominant land uses in the project area. No developed recreation sites occur on the area; however, dispersed recreational activities such as big game hunting do occur. Project-required lands are in Visual Resource Management Class III (53 acres), Class IV (188 acres), and Class V (177 acres) areas.

Communities closest to the project area are Jeffrey City (14 miles northwest), Lander (70 miles northwest), Riverton (70 miles northwest), and Rawlins (80 miles southeast). Access to the project area is from Highway 135 to Jeffrey City and south along the Crook Gap Wamsutter road to the Big Eagle Haul Road, Anaconda Road, and Jackpot Mine Access Road.

Numerous standard, project-specific, and site-specific mitigation measures would be employed during all phases of the project to assure that potential impacts are minimized. For example, disturbance of sensitive areas (e.g., steep slopes, raptor nesting areas) would be avoided as much as possible, and construction activities would be authorized only during appropriate seasons. Surveys and subsequent monitoring would be conducted for cultural resources, paleontological resources, winter big game use, raptor nests, and sage grouse leks to document their status relative to disturbance activities. Reclamation would be conducted as soon as practical on areas disturbed during initial construction. Upon completion of the project, all surface facilities would be removed, and most disturbed areas would be reclaimed and revegetated.

Project impacts to paleontology, groundwater resources, odor, wetlands, wild horses, socioeconomics, livestock grazing, and visual resources are expected to be negligible. Moderate impacts to geologic hazards, surface water resources, noise, vegetation, wildlife, and land use are expected due to project activities. Potential significant impacts resulting from the proposed project include fugitive dust emissions along project-required roads, the depletion of uranium reserves from the Battle Springs Formation, alteration of the No Name drainage, temporary preclusion of oil and gas development, reactivation of stabilized sand dunes, and degradation of cultural/historic resources at Site 48FR479 and along the Rawlins-Fort Washakie stage road. Cumulative impacts from existing, proposed, and potential future developments in the area are not expected to exceed the impact levels identified for the proposed project. After the project is completed and the area reclaimed, there would be negligible impacts to the character of the area. No adverse effects are anticipated for threatened and endangered species. There would be beneficial project impacts associated with lessened U.S. dependence on foreign energy sources; increased tax revenues; increased employment; and increased use of local goods and services.

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1.0 INTRODUCTION

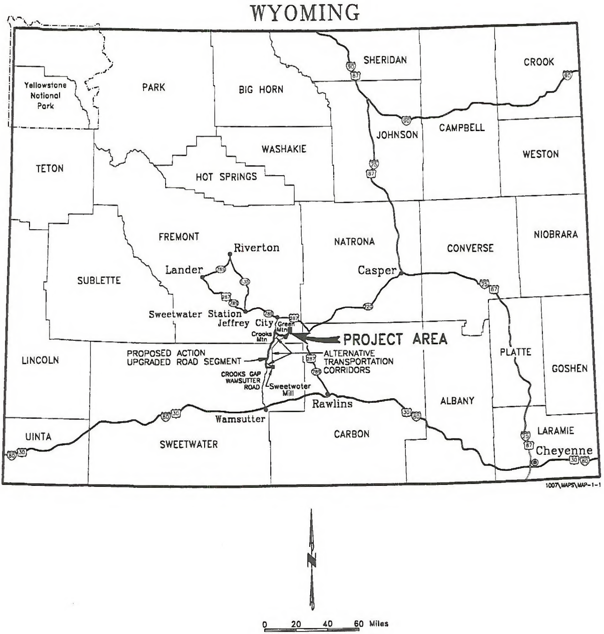
U.S. Energy Corporation (USE) and its affiliate, Crested Corporation have entered into a mining venture with Kennecott Uranium Company (Kennecott) to form the Green Mountain Mining Venture (GMMV). GMMV proposes to develop an underground uranium mine (i.e., the Jackpot Mine), on the southern side of Green Mountain, 14 miles southeast of Jeffrey City in Fremont County, Wyoming (Map 1.1). Two mine portals, an access road, water well (Permit No. 75407), and 34.5 kilovolt (kV) power line and electrical power substation were constructed at the site under Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD) License to Explore 179LE, and a Bureau of Land Management (BLM) approved Plan of Operations (Serial No. WYW 127558). The existing surface support facilities (i.e., the shop/office/change rooms and warehouse complex) at the adjacent Big Eagle Mine (WDEQ-LQD Mine Permit No. 451) would be utilized during development and operation of the Jackpot Mine. Previous development in the area has been extensive and includes surface and subsurface uranium mines (i.e., the Big Eagle, Sheep Mountain, and Crooks Gap Mines), oil, gas, and uranium exploration wells, access roads, power lines, and other infrastructures.

Prior to the initiation of mining operations, GMMV proposes further underground exploration in the area and, if this exploration fails to identify uranium resources with future development potential, the project would not proceed. If uranium resources with development potential are discovered, GMMV proposes to construct, operate, and reclaim an underground uranium mine beginning in the mid- to late 1990s and continuing for a period of 13 to 25 years (i.e., life-of-project [LOP]). It is anticipated that approximately 3,000 tons per day (tpd) of ore would be mined at the site and transported approximately 22 to 37 miles along improved or newly constructed transportation corridors to the existing Sweetwater Uranium Mill for recovery of uranium oxide. Roads along proposed transportation corridors would be developed and/or improved as necessary prior to use. The proposed mine site, WDEQ-LQD permit area, surface facilities, and access roads are presented on Map 1.2; proposed transportation corridors, including access and haul road locations are presented on Map 1.3. The entire WDEQ-LQD permit area and northern portions of the proposed transportation corridors are within the BLM Lander Resource Area (LRA); southern portions of the proposed transportation corridors are located within the BLM Great Divide Resource Area (GDRA) (Map 1.3).

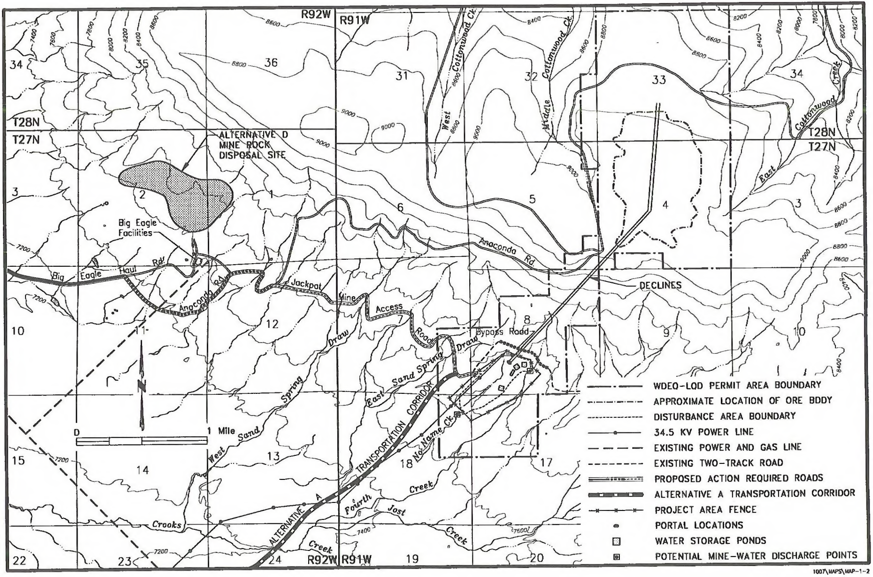
The maximum area of new disturbance required for the Proposed Action would be 289 acres. This disturbance would include 118 acres for mine site development (i.e., the fenced mine site) and 171 acres (37 miles maximum) for transportation corridor construction and/or improvement.

This Environmental Impact Statement (EIS) was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and is intended to provide decision-makers and the public with a complete and objective evaluation of impacts, both beneficial and adverse, resulting from the Proposed Action and reasonable alternatives. This document has been prepared in compliance with all applicable regulations and laws passed subsequent to NEPA, including Council of Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508); the Federal Land Policy and Management Act (FLPMA) and other surface management regulations (43 CFR 3809); U.S. Department of the Interior (USDI) guidelines in *Department Manual 516, Environmental Quality* (USDI 1980); and guidelines listed in the BLM *NEPA Handbook, H-1790-1* (BLM 1988a).

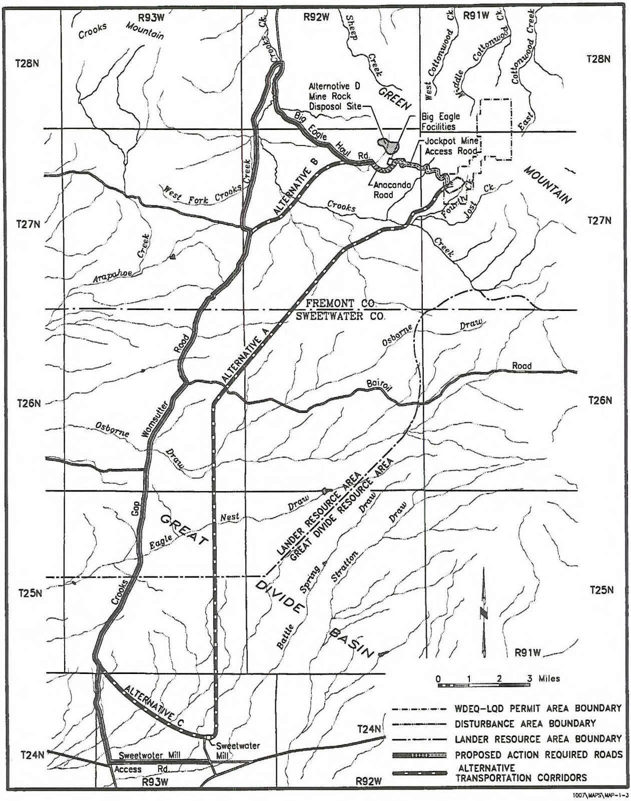
The federal action for the proposed development consists of the authorization of mine construction and associated operation activities on federally administered lands. The analysis in this EIS and



Map 1.1 Project Location, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.



Map 1.2 WDEQ-LQD Permit Area and Associated Facilities, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.



Map 1.3 Mine Site and Haul Road, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

all subsequent decisions documented in the Record of Decision (ROD) will guide the implementation of the Proposed Action; however, these documents are not the only environmental reviews upon which authorization is based (see Section 1.3 Authorizing Actions).

This EIS, through interdisciplinary preparation and review, consideration of reasonable alternatives, and public participation, serves as a vehicle for:

- defining project activities and related environmental impacts,
- assisting the decision-making process, and
- identifying and developing appropriate mitigation measures to minimize environmental impacts.

1.1 PURPOSE AND NEED

The purpose of GMMV's Proposed Action is to develop and operate an underground uranium mine, known as the Jackpot Mine, to extract uranium ore and transport the ore to an existing milling facility (i.e., the Sweetwater Uranium Mill, U.S. Nuclear Regulatory Commission [NRC] Source Material License No. SUA-1350) to produce an economically saleable resource. Locatable mineral development projects on public lands are administrated and regulated by the BLM. U.S. mining law and the regulations by which it is enforced recognize the statutory right of mining claimholders to develop federal mineral resources to meet a continuing national need for these resources as long as unnecessary and undue environmental degradation is not incurred. Further, such development is encouraged and is consistent with the Mining and Mineral Policy Act of 1970 and FLPMA. Regulations within these and other acts require the responsible federal agencies to review the applicant's Proposed Action to ensure that:

- adequate provisions are included to minimize, where feasible, adverse environmental impacts to surface resources on public lands;
- measures are included to provide for reclamation; and
- the Proposed Action will comply with other applicable federal and state laws and regulations.

1.2 RELATIONSHIP TO EXISTING POLICIES, PLANS, AND PROGRAMS

The oversight of exploration and development activities on unpatented mining claims on public lands is an integral part of the BLM locatable mineral program under the authority of the 1872 Mining Law, the Multiple-Use Sustained Yield Act of 1960, the Mining and Mineral Policy Act of 1970, and FLPMA. The BLM's Lander Resource Area Management Plan (LRA RMP) (BLM 1986a:401) and subsequent ROD (BLM 1987a:27) reviewed all public lands in the project area and determined them open for locatable mineral exploration and development, subject to certain standard protection requirements for surface-disturbing activities.

This EIS is tiered to the LRA RMP (BLM 1986a) and ROD (BLM 1987a). The proposed project would be consistent with management decisions, requirements, and guidelines specified in the RMP and ROD, and other existing and relevant federal, state, and county documents. The proposed project would also be consistent with the GDRA RMP (BLM 1987b, 1988b) and ROD (BLM 1990a), the Fremont County Natural Resources and Land Use Inventory and Analysis (Hufferd and Pernula 1975), the Fremont County Land Use Plan (Fremont County Planning Commission 1978), the Sweetwater County Land Use Plan (THK Associates, Inc. 1977), and the State of Wyoming Land Use Plan (Wyoming State Land Use Commission 1979).

Milling operations at the existing Sweetwater Uranium Mill are permitted and licensed by the NRC. Existing Environmental Assessments (EAs) (NRC 1985, 1992) and an Environmental Report (ER) (Kennecott 1994) will be utilized and referenced as appropriate to assess the cumulative impacts of the Proposed Action in combination with activities conducted at the mill.

1.3 AUTHORIZING ACTIONS

The Proposed Action would comply with all relevant federal, state, and local laws. Table 1.1 lists all authorizing actions required for project compliance. Foremost among these are a permit to mine from the WDEQ-LQD and approval of the mining and reclamation plan (Plan of Operations [43 CFR 3809]) by the BLM. All issues raised during scoping will be addressed during permitting activities (see Section 1.4).

Milling operations performed at the Sweetwater Uranium Mill are permitted and licensed by the NRC and meet NRC and U.S. Environmental Protection Agency (EPA) requirements. However, since the Sweetwater Uranium Mill is currently licensed and the resumption of milling operations could occur without the Proposed Action, only the cumulative effects of activities conducted at the mill in combination with the effects of the proposed mining operation are addressed in this EIS.

The proposed mining operation would be conducted in accordance with Mine Safety and Health Administration (MSHA) rules and regulations as enforced by MSHA and the Wyoming Mine Inspector. Explosive materials would be handled within the laws and regulations administered by MSHA, the Bureau of Alcohol, Tobacco, and Firearms, and the State Fire Marshall.

Existing roads and power lines on public lands within the area have been approved as components of a Plan of Operations for exploration by the BLM under the authority of FLPMA and BLM surface management regulations. Rights-of-way (ROWs) for the proposed transportation corridor along the Crooks Gap Wamsutter county road have been authorized under FLPMA. Newly proposed transportation corridor alternatives to the Sweetwater Mill would be authorized as part of the operating plan for the proposed mine (see Map 1.3). The project would adhere to management directions specified for locatable mineral development in the BLM LRA RMP (BLM 1986a) and ROD (BLM 1987a) and the BLM GDRA RMP (BLM 1987b, 1988b) and ROD (BLM 1990a). All new and existing transportation corridors on BLM lands would conform to BLM standards. Standard protection requirements for surface-disturbing activities are intended to provide for protection of:

- wildlife resources,
- vegetation resources,
- soil resources,
- cultural resources,
- paleontological resources,
- wetland/riparian areas,
- current land uses,
- water resources,
- visual resources, and
- public safety/human health.

1.4 PUBLIC INVOLVEMENT, ISSUES AND CONCERNS, AND CONSULTATION

On April 2, 1993, the BLM mailed approximately 137 scoping statements to government agencies, environmental organizations, industry representatives, individuals, landowners, lessees, and grazing permittees with a potential interest in the proposed project. Local and regional media received both the scoping statement and a press release. The scoping statement explained the scope of GMMV's Proposed Action and requested comments on issues, concerns, and alternatives that should be addressed in this EIS. Modifications regarding the NEPA requirements for the proposed project were made in November 1993 (i.e., an EIS rather than an EA would be prepared for the proposed project), and another scoping statement identifying these changes was mailed to the aforementioned potentially interested parties. Comment letters were accepted until January 18, 1994, and 43 comment letters were received. A list of the respondents is given in Table 1.2. Two additional comment letters from the Wyoming Outdoor Council were received after the conclusion of the formal scoping period. All written comments were considered in this EIS.

Two scoping meetings were held to further identify potential issues and concerns regarding the

Table 1.1 Federal, State, and County Authorizing Actions, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Agency	Nature of Action
FREMONT AND SWEETWATER COUNTIES	Building/conditional use permits
	Special use permits for pipelines
	Small wastewater system permits, where applicable
	Driveway access permits, where access roads intersect with county roads
	Road use agreements and/or oversize trip permits when traffic on county roads exceeds established size and weight limits or where the potential for excessive road damage exists
	Zone change plans and/or certificates, where applicable
	Filing fees
	Noxious weed control
NRC	Materials License SUA-1350 for Sweetwater Uranium Mill (completed, expiration date June 30, 1997)
	ER and Amendment to SUA-1350 for processing of ion exchange resins
	EA for renewal of the Sweetwater Uranium Mill Source Material License SUA-1350 in conjunction with a transfer of the license from Minerals Exploration Company to Kennecott (completed)
U.S. DEPARTMENT OF THE ARMY	
U.S. Army Corps of Engineers (COE), Omaha District	Section 404 Permits as necessary for compliance with the Clean Water Act
	Coordination with COE regarding all necessary placement of dredged or fill material in area waters and their adjacent wetlands, as specified in 40 CFR 230
USDI	
BLM, Rawlins District LRA and GDRA	Approval/ROD for Plan of Operations, including Mine and Reclamation Plan, bond, access and haul roads, power lines, pipelines, and other facilities properly included in Plan of Operations.
	Approval to dispose of mine water
U.S. Fish and Wildlife Service (USFWS)	Review of impact on federally listed threatened and endangered (T&E) or candidate fish, wildlife, and plant species

Table 1.1 (Continued)

Agency	Nature of Action
EPA	Resource Conservation and Recovery Act (RCRA) permits for treatment, storage, or disposal of hazardous waste
	Air quality (i.e., radon) monitoring and reporting requirements
WYOMING BOARD OF LAND COMMISSIONERS AND LAND AND FARM LOAN OFFICE	Temporary use permits on State Lands
WDEQ	
Air Quality Division (AQD)	Issue air quality construction and operation permit
Land Quality Division (LQD)	Issue permit and license to mine and approval of mining and reclamation plans
	Bonding
Water Quality Division (WQD)	Approval of sewage treatment facilities (groundwater pollution control permit)
	Section 401 certification for stream crossings
	Dam/Diversion Construction Permits
	Stormwater Pollution Prevention Plan (402 Permits)
	Approval of mine water disposal
	Issuance of National Pollutant Discharge Elimination System (NPDES) permits; enforcement of State Water Quality Rules and Regulations
	Enforcement of State Water Quality Rules and Regulations (surface water and groundwater)
WYOMING HIGHWAY COMMISSION	Conformance with applicable size and weight limits for trucks
WYOMING STATE ENGINEER'S OFFICE (WSEO)	Temporary permit to use and store water
	Water well permit
	Dewatering permits (Form U.W. 5)
WYOMING STATE HISTORIC PRESERVATION OFFICE (SHPO)	Adherence to Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800)
	Programmatic Agreement and/or consultation for cultural resource inventory, evaluation, and mitigation

Table 1.2 List of EA and EIS Respondents, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Apache Corporation
Basin Oil of Wyoming, Inc.
Eli D. Bebout, Wyoming House of Representatives (2)
BLM
Bureau of Reclamation
Carbon County Chamber of Commerce
Carbon County Economic Development Corporation (2)
Carbon County T.V.
Central Wyoming College Learning Resource Center
Doug Chamberlain, Speaker, Wyoming House of Representatives
City of Lander
City of Rawlins (2)
City of Riverton
Henry H.R. Coe, Wyoming State Senate
John Dewitt
Jerry B. Dixon, President, Wyoming State Senate
Joe Dolan, Central Wyoming College
EPA
Fremont County Commissioners (2)
Geological Survey of Wyoming (2)
Robert Grieve, Wyoming State Senate
Kelly Hunt
LM Olson Construction
Loraine Ocenas, Fremont County Assessor
Robert Peck, Wyoming State Senate
Joe Reed
Rice Enterprises
Riverton Chamber of Commerce
Riverton Economic Betterment
Riverton Memorial Hospital
South Central Industrial Association of Wyoming
SHPO
Harry B. Tipton, Wyoming House of Representatives
Undersigned Residents of Wyoming (12 signatures)
USFWS (2)
Ute Tribal Council
William J. Vasey, Wyoming House of Representatives
Mrs. Ray Weber, Weber Ranch Company
Loren "Teense" Willford, Wyoming House of Representatives
Dan Williams, Big Mountain Insurance
Wind River Multiple Use Advocates (2)
Wyoming Department of Employment, Riverton Job Service
WDEQ
Wyoming Game and Fish Department (2)
Wyoming Outdoor Council (2)
Wyoming Public Service Commission

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[1] The list includes the names of respondents providing written responses to scoping statements prior to January 18, 1994. Numbers in parentheses indicate the number of responses received.

proposed project. Scoping meetings were advertised through press releases, and notices were published in local and regional newspapers. Meetings were held on June 2, 1993, in Jeffrey City and June 3, 1993, in Riverton. Fifty-nine individuals attended the meeting in Jeffrey City and 62 individuals attended the Riverton meeting. No negative comments regarding the proposed project were received during these meetings; the majority of commentors expressed their desires for project authorization and identified potential economic benefits.

Issues and concerns identified during scoping by the public, the BLM, and other governmental organizations that among others are considered in this EIS include:

- delays in project authorization;
- condition construction approval on improvements in the uranium market;
- incorporation by reference;
- listing of authorizing actions;
- EIS concurrence with NEPA processes;
- need for an EIS;
- NEPA document preparation for the Big Eagle, Crooks Gap, Sheep Mountain, or Sweetwater Mines;
- reclamation and bonding adequacy;
- need for the project;
- identification of cooperating agencies;
- need for EPA, U.S. Bureau of Mines, U.S. Geologic Survey (USGS), and other government organizations to be involved in scoping;
- need for additional reviews of the proposal after WDEQ-LQD approval of the mine permit;
- adequate tailings pile and impoundment description;
- consideration of alternatives for waste disposal, stockpiling, mining methods, water treatment and disposal, and transportation routes;
- hazardous material volumes, use, storage, transport, and disposal, and pollution control plan adequacy;
- adequate description of the existing environment;
- air quality impacts, including dust and radon emissions, and associated mitigation and monitoring measures;
- adequacy of existing geologic descriptions of Green Mountain;
- presence of active faults, landslide areas, and windblown sand deposits in the vicinity of the project;
- potential for uranium ore to contain gold and other metals in economically recoverable concentrations;
- subsidence;
- efficacy of portal plugging and long-term monitoring;
- impacts to paleontology;
- soil erosion impacts and mitigations;
- adequacy of existing baseline groundwater and surface water quality and quantity data;
- short- and long-term impacts analyses, including a worst-case analysis of impacts to surface and subsurface hydrology including water quantity and quality, runoff effects, acid drainage, erosion, and aquatic resources (e.g., trout habitat);
- mitigation and monitoring measures for protection of surface and subsurface water quality and quantity;
- description of the water treatment facility, including potential contaminants and treatment methods;
- description of contingency plans in the event groundwater and/or surface water is contaminated;
- radioactive surface water pits identified on Green Mountain above the ore body in 1991;
- noise impacts and mitigations;
- impacts to wetlands and rare and sensitive plants;
- project impacts to wildlife and fisheries, including big game, raptors, sage grouse, wild horses, and T&E species;
- habitat loss, mitigation, and preservation;
- biodiversity;
- impacts to wildlife, wild horses, livestock, existing land use, and health and safety from increased transportation corridor use,

construction, and maintenance, including snow removal and control, and dust control;

- seasonal disturbance and impacts to migrating antelope from fences and/or extensive use of snow fences or plowed snow berms along roadways;
- use of existing roadways to minimize wildlife and habitat impacts;
- impacts to prehistoric and historic cultural resources and adherence to National Historic Preservation Act and Advisory Council Regulations;
- socioeconomic benefits to local, county, and state economies, including increases in jobs and tax revenues;
- availability of housing in Jeffrey City;
- impacts to local government services;
- increased traffic on roads from Riverton, Lander, Casper, and Rawlins;
- worker health and safety;
- mine employee requirements;
- impacts from increased populations in Lander, Riverton, and Jeffrey City;
- unreasonable restrictions on the provision of existing utility services or construction of utility and pipeline facilities, and costs for relocating utility and pipeline facilities;
- impacts from ore and personnel transport and transportation safety training;
- inconsistency of the alternative transportation corridor with the LRA RMP and ROD;
- conflicts with existing land uses;
- impacts to recreation, specifically the proposed Continental Divide National Scenic Trail System;
- impacts to visual resources, including visibility impairments;
- direct, indirect, and cumulative (i.e., past, present, and reasonable foreseeable future) impacts;
- impacts from resumption of activities at the Sweetwater Uranium Mill, and the Big Eagle, Sheep Mountain, Crooks Gap, and Sweetwater Mines, including water storage and use;
- pollution prevention;
- human health and environmental risks from hazardous materials and associated mitigation measures;
- irreversible and irretrievable resource commitments; and
- local short-term use versus long-term productivity.

This EIS was prepared by a third-party contractor (Mariah Associates, Inc. [Mariah], of Laramie, Wyoming), with the BLM (Rawlins District Office, Rawlins, Wyoming, and Lander Resource Area Office, Lander, Wyoming) as the lead agency providing guidance, input, participation, and independent evaluation. The BLM, in accordance with 40 CFR 1506.5 (a) and (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

2.0 THE PROPOSED ACTION AND ALTERNATIVES

The environmental analysis for the proposed Jackpot Mine project includes an assessment of the Proposed Action (i.e., development of the underground uranium mine and associated upgrades of existing roads); an assessment of three transportation corridor alternatives; and an assessment of an alternative waste rock disposal site (see Map 1.3). The No Action Alternative (i.e., the project would not proceed) is also assessed. The BLM preferred alternative is a combination of the Proposed Action (see Section 2.1) and Alternatives B and C (see Sections 2.2.2 and 2.2.3, respectively) for mine access and ore hauling and Alternative D (see Section 2.2.4) for mine waste rock disposal. The Alternative B and C roads would be subject to modifications in alignment necessary to minimize or avoid adverse impacts to riparian and cultural (both prehistoric and historic) resources. The modifications would also be based on considerations such as using existing disturbed areas where practical, landowner negotiations on non-federal lands, and a road design engineered to address safety, soil limitations, slope, drainage, and the points of intersection with the Crooks Gap Wamsutter Road. All of the above factors would be utilized to select the final alignment.

The types and acreage of existing disturbance associated with the Proposed Action and alternatives are given in Table 2.1. Additional alternatives involving alternate mining and ore transportation procedures were considered but rejected for environmental and/or economic reasons (see Section 2.3).

2.1 THE PROPOSED ACTION

The development of the Jackpot Mine has been described in detail in the WDEQ-LQD Permit Application for the Jackpot Mine (GMMV 1994), which served as the basis for the project description presented herein. Information on the proposed transportation corridor was obtained through personal communications with GMMV, BLM, and other agency personnel.

2.1.1 Project Overview

The Jackpot Mine, formerly known as the Green Mountain Project, is a proposed underground uranium mine that would develop known uranium resources on Green Mountain in central Wyoming, approximately 14 miles southeast of Jeffrey City (see Map 1.1). Approximately 3,000 tpd of uranium ore would be mined within the WDEQ-LQD permit area and transported approximately 37 miles in covered trucks to the existing Sweetwater Mill for recovery of uranium oxide (U_3O_8) (see Maps 1.2 and 1.3).

Access to portal facilities would be from the Crooks Gap Wamsutter Road to the existing Big Eagle Haul Road, Anaconda Road, and Jackpot Mine Access Road (see Maps 1.2 and 1.3). All existing roads would be upgraded as necessary to accommodate increased traffic and ore hauling. Portal facilities are currently in place (see Map 1.2). Underground access for mining the ore would be along two parallel declines driven at an approximately -16.8% grade, and each would be approximately 12,300 feet long. The west decline (i.e., the access decline) would be used as an intake airway and would provide mine access for personnel, supplies, and equipment, whereas the east decline (i.e., the conveyor decline) would provide an outlet for exhaust ventilation and a conveyor gallery for mined material. Pipelines for mine-water drainage and mine services would be distributed in both declines.

The primary surface support facilities for the proposed mine would be the existing shop/office/change rooms and warehouse facility at the Big Eagle Mine (WDEQ Mine Permit 451), located approximately three miles west of the Jackpot Mine site. Newly constructed facilities required for the proposed mine would be located at the Jackpot Mine site and would include buildings for emergency response equipment, shift staging, offices, and a small warehouse. In addition to the existing electrical power substation and overhead power lines, a water tank, water

Table 2.1 Types and Acreages of Disturbances, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

	Proposed Action			Alternative A[1]			Alternative B[1]			Alternative C[1]			Alternative D[1]		
Disturbance Type	Existing[2]	New[3]	LOP[4]	Existing[2]	New[3]	LOP[4]	Existing[2]	New[3]	LOP[4]	Existing[2]	New[3]	LOP[4]	Existing[2]	New[3]	LOP[4]
Mine Site[5]	30	118	147	30	118	147	30	118	147	30	118	147	127	118	244
Jackpot Mine Access/Haul Road[6]	16	12	17	16	12	17	16	12	17	16	12	17	16	12	17
Anaconda Access/Haul Road[7]	7	10	10	7	10	10	7	10	10	7	10	10	7	10	10
Big Eagle Access/Haul Road[8]	61	0	40	61	0	40	61	0	40	61	0	40	61	0	40
Crooks Gap Wamsutter Haul Road[9]	191	112	181	0	0	0	144	85	137	166	98	159	191	112	181
Mill Access/Haul Road[10]	2	37	23	0	0	0	2	37	23	0	0	0	2	37	23
Alternative A Haul Road[11]	0	0	0	16	247	158	0	0	0	0	0	0	0	0	0
Alternative B Haul Road[12]	0	0	0	0	0	0	0	50	30	0	0	0	0	0	0
Alternative C Haul Road[13]	0	0	0	0	0	0	0	0	0	0	52	31	0	0	0
Total	307	289	418	130	387	372	260	312	404	280	290	404	404	289	515

[1] Alternative A is a transportation alternative involving the construction of a new corridor linking the proposed Jackpot Mine with the existing Sweetwater Mill. Alternative B is a transportation corridor involving the construction of a new corridor linking the Big Eagle Haul Road to the Crooks Gap Wamsutter Road. Alternative C is a transportation alternative involving the construction of a new corridor linking the Crooks Gap Wamsutter Road to the existing Sweetwater Mill site. Alternative D is a mine waste rock disposal alternative involving the placement of mine waste rock from the proposed Jackpot Mine at an existing pit at the Big Eagle Mine site.

[2] Includes all existing disturbances required for the Proposed Action and alternatives (i.e., existing Big Eagle facilities and pits [Alternative D], roads, and disturbance that occurred under License to Explore 179LE at the proposed Jackpot Mine site).

Table 2.1 (Continued)

[3] Includes all additional disturbances initially required for the Proposed Action and alternatives (i.e., the fenced Jackpot Mine site and entire road easement areas).

[4] Includes only those areas that would remain disturbed throughout the LOP (i.e., existing and new disturbances necessary for the project, minus areas reclaimed immediately following construction [see footnotes 5-13]).

[5] Includes Big Eagle facilities area, the proposed Jackpot Mine site, and, under Alternative D, the area occupied by the west pit (i.e., the largest pit) at the Big Eagle Mine. While only 42 acres of surface disturbance would be required at the mine site for the Proposed Action and Alternatives A, B, and C, and only 10 acres of disturbance would be required for Alternative D, the entire 125-acre fenced mine site would be unavailable for many area resources.

[6] The Jackpot Mine Access/Haul Road is an existing road with approximately 56 feet of existing width disturbance along its 2.3-mile length. During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

[7] The Anaconda Access/Haul Road is an existing road with approximately 44 feet of width disturbance along the 1.4-mile length required for the project. During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

[8] The Big Eagle Access/Haul Road is an existing road with approximately 91 feet of width disturbance along its 5.5-mile length. No further disturbance would occur along this road as a result of the Proposed Action and alternatives, and approximately 31 feet of existing disturbance would be reclaimed such that 60 feet of width disturbance would remain for the LOP.

[9] The Crooks Gap Wamsutter Road is an existing county road with approximately 63 feet of width disturbance along the various lengths required for the proposed project (25.0 miles for the Proposed Action and Alternative D, 21.8 miles for Alternative C, 18.9 miles for Alternative B, and 0.0 mile for Alternative A). During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

[10] The Mill Access/Haul Road currently is an existing two-track road with approximately 6 feet of existing width disturbance along the 3.2 miles length required for the Proposed Action and Alternatives B and D. During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

[11] The Alternative A Haul Road (21.7 miles) would be a new road connecting the Jackpot Mine site directly with the Sweetwater Mill. Approximately 17.7 miles of this road would follow existing two-track roads with an estimated disturbance width of 6 feet. During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

[12] The Alternative B Haul Road (4.1 miles) would be a new road connecting the Big Eagle Haul Access/Road and the Crooks Gap Wamsutter Road. During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

[13] The Alternative C Haul Road (4.3 miles) would be a new road connecting the Crooks Gap Wamsutter Road with the Sweetwater Mill. During construction, it is estimated that the entire easement width (100 feet) would be disturbed, and approximately 60 feet of width disturbance would remain for the LOP.

well, water discharge and treatment facilities, ore stacking and loading facilities, areas for ore stockpiling, mine rock and topsoil storage, sewage treatment, explosive storage, and vehicle parking would also be required at the proposed mine site.

2.1.2 Mine Plan

2.1.2.1 Nature of the Ore and Ore Reserves

Existing data on the uranium resource at the proposed Jackpot Mine has been developed from surface exploration drill holes. The data indicate a uranium resource in excess of 40,000 tons, covering an area of about one square mile. The uranium resource occurs as sandstone-hosted uraninite and coffinite and is found in multiple flat-lying layers over an elevational range of approximately 1,000 feet, between 2,500 and 3,500 feet beneath the surface of Green Mountain. Additional subsurface exploration could locate additional reserves of minable grade materials in the area.

Complete definition of the uranium resource through surface drilling would be environmentally and economically prohibitive, since as many as 1,000 holes would need to be drilled on 100-foot x 100-foot spacings, resulting in significant surface disturbance on Green Mountain (i.e., approximately 1,000 acres). In addition, the total cost of a surface drilling project would be approximately $150 million ($150,000 per hole), and this activity would not precisely define reserve locations. The proposed development calls for defining the Green Mountain uranium resource through underground mining, sampling, and exploration drilling, thereby minimizing adverse environmental impacts to the ground surface while providing additional cost-effective, reliable resource data.

2.1.2.2 Portals

The portals for the proposed mine have been constructed in association with exploration activity under the existing License to Explore 179LE. The embankment material in which the portals are located consists of conglomerate to fine-grained sandstones of the Battle Springs Formation. The embankment face above the portals has been covered with wire mesh, rock-bolted to the bank, and covered with shotcrete. During mining, the embankment would be continually monitored and maintained. The ground support at the portal entrances consists of steel sets and associated rock bolting with concrete liners (40 to 60 feet long) to preclude subsidence.

2.1.2.3 Declines and Mine Ventilation

The access and conveyor declines would be excavated by mechanical mining methods, with the material being removed by shuttle cars and/or conveyors. The two declines would be connected by cross-cuts every 500 to 1,000 feet.

During mine development and initial production, mine ventilation would be taken in through the access decline and exhausted through the conveyor decline. At full production, additional drifts for air intake and exhaust may be developed. If additional ventilation drifts connecting the mine workings with the surface are required, they would be located within either the WDEQ-LQD Jackpot Mine or Big Eagle Mine permit areas (see Map 1.2). The exact location of the additional ventilation facilities would be determined upon completion of the final mine and ventilation plans, the details of which are dependent upon data collected during the proposed underground exploration program.

2.1.2.4 Mining Method

A number of potential mining techniques and methods were initially considered for the extraction of ore at the proposed Jackpot Mine; however, the flat-lying, narrow seam-like deposits at the site limit the variety of mining methods that could be economically employed (see Section 2.3). Current information on the ore deposition and rock mechanics at the proposed mine site suggest that the following mining methods may be used singularly or in combination:

- room and pillar methods utilizing retreat mining of the pillar ore, drill and blast techniques, and load, haul, and dump units with trucks or panel belt conveyors; and/or
- continuous mining methods utilizing continuous miner machines and shuttle cars.

Final selection of the mining methods to be employed is dependent upon the results of the underground exploration program, but would in any case optimize resource extraction and utilization of equipment and personnel.

2.1.2.5 Required Equipment and Facilities

Table 2.2 lists the types of equipment that likely would be employed during mining operations. The specific numbers and types of equipment would be determined as mining techniques are defined and implemented. The proposed surface equipment is typical for underground mines and includes equipment for ore and rock handling, transportation, and support operations.

Existing equipment and facilities at the Big Eagle Mine would be used to the maximum extent possible during development and operation of the Jackpot Mine, thus minimizing the need for newly constructed work and storage areas. The existing Big Eagle facilities site occupies an area of approximately 23 acres, and was constructed to accommodate a 200- to 250-employee operation. Facilities at the site include:

- an office complex;
- warehouse;
- maintenance shops;
- first aid facilities;
- male and female change rooms;
- lunch rooms;
- meeting rooms;
- fuel oil storage and dispensing facilities; and
- materials storage area.

A building to provide limited office facilities would be constructed at the Jackpot Mine site to accommodate mine operation supervisors, mine engineering, geologic and technical support services, health and safety staff, and emergency support personnel and equipment. This support building would be designed, constructed, and located to minimize adverse visual impacts to the surrounding environment.

The entire, fenced Jackpot Mine site would occupy an area of approximately 125 acres, 7 acres of which have already been disturbed under License to Explore 179LE. While only approximately 42 acres of disturbance are anticipated, the entire 125 acres would be unavailable for some resources (e.g., wildlife, recreation), and therefore is considered disturbed for the purpose of most analyses presented herein.

The proposed mining operation would require some storage of products, materials, and supplies at the Jackpot Mine Site.

- Explosives. Explosive storage facilities have been installed under License to Explore 179LE.
- Petroleum Fuel Products (e.g., diesel fuel, gasoline). All petroleum products would be stored in aboveground tanks with secondary containment, in accordance with applicable regulations. Storage tanks may be double-walled, lined, and/or bermed. Bermed secondary containment areas would be sized to provide either 150% of the capacity of the largest contained tank or, if the tanks are interconnected, 150% of the total tank volume. The capacity of the fuel storage facilities would be on the order of 10,000 gallons diesel fuel, 5,000 gallons gasoline, and various capacities of other petroleum products. Actual volumes may vary, depending on mining requirements. The design and construction of the storage and containment facilities would be certified by a Professional Engineer.
- Water. Both potable and fire control water would be stored on-site in one approximately 90,000-gallon tank. This water would be supplied from an existing

Table 2.2 Proposed Equipment List, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

UNDERGROUND EQUIPMENT
- Fixed Equipment
  - Main decline conveyor
  - Trunk conveyors
  - Primary ventilation fans
  - Primary dewatering pumps (sized as necessary for inflows)[2]
  - Electrical substations and transformers
  - Sundry ancillary equipment (e.g., underground maintenance shops, sample analysis stations, communication systems)
- Mobile Equipment
  - Two-boom drill jumbos (electro-hydraulic)[3]
  - Jack legs[3]
  - Scoop trams[3]
  - Load-haul-dump units (diesel or electric)[3]
  - Rear-dump trucks (diesel)[3]
  - Continuous miners (electric)[2]
  - Shuttle cars[2]
  - Gate conveyors (electric)[2]
  - Rock-bolting jumbos (electro-hydraulic)
  - Longhole (exploration) drills
  - Secondary/booster fans
  - Sundry diesel utility/service vehicles (e.g., fuel and maintenance, explosives/loading and materials trucks, personnel carriers, ventilation service vehicles)
- Miscellaneous
  - Mine-water discharge pumps
  - Electrical switchgear, power centers, and controls

SURFACE EQUIPMENT
- Ore stockpile and reclamation facility (including facility for discharge of batched waste rock)
- Front-end loaders
- Ore haul trucks[4]
- Graders (for road maintenance)
- Water truck (for dust suppression)
- Flat-bed trucks
- Dump trucks with snowplows
- Forklifts
- Ambulance
- Crew vans/buses
- Pick-up trucks
- Administrative office and equipment[4]
- Engineering office and equipment[4]
- Surface overhaul workshop and equipment[4]
- Change-room facilities (male and female)[4]
- Building for health and safety staff, emergency equipment, and limited office facilities

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[1] The specific numbers and types of equipment to be used would be determined as mining techniques are defined and implemented and may be different than those proposed herein.

[2] Continuous mining method only.

[3] Room and pillar method only.

[4] Currently located at Big Eagle Mine.

water well (Permit No. 75407) or a newly drilled well, and treatment, if required, would be conducted in or adjacent to the support building.

- Uranium-bearing Materials. It is anticipated that ore would be transported to the Sweetwater Mill concurrently with mine production. An ore stockpile area capable of accommodating 300,000 tons of material would be located at the Jackpot Mine site to allow mining to continue on an alternate schedule than the ore-hauling operation.
- Mine Rock Piles. A mine rock pile has been developed at the site under the existing License to Explore 179LE, and additional piles would likely be required. Barren rock pile slopes would not exceed 20°. As conditions allow, some mine rock may be permanently placed underground in mined-out workings.
- Topsoil Stockpiles. Existing stockpiles along the access road have been developed under License to Explore 179LE. These stockpiles are set back from the road so that they are not impacted by road maintenance and operations or washing of cut-and-fill slopes. Additional stockpiles would be developed and located appropriately to facilitate topsoil spreading and revegetation operations on completion of mining. No stockpile slope would exceed 20°.
- Subsoil Stockpiles. Subsoils would be stockpiled separately from topsoil, and slopes would not exceed 20°.
- Spare Parts and Operating Supplies. These materials would be stored in either a warehouse building or open warehouse yard at the Jackpot Mine site or Big Eagle facilities location.
- Mine Roof Support Material. Mine roof support materials, consisting of rock bolts, steel sets, lumber, and other materials would be stockpiled at the mine site warehouse yard.
- Chemicals. All chemicals required for mining operations would be stored at the Jackpot Mine site or Big Eagle facilities location in an appropriate manner, and secondary containment would be used where required.
- Ventilation System Equipment and Materials. These materials would be stored in an open warehouse yard or building at the Jackpot Mine site or Big Eagle facilities location.
- Other Supplies. Other materials would be stored at the mine site in sufficient quantities to support an efficient mining operation.

2.1.2.6 Topsoil and Mine Rock Management

Soils would be disturbed for the proposed mining operation only in association with road and surface facility construction. All cut-and-fill slopes initially disturbed during construction but not required for project operations would be topsoiled and reseeded with a mixture of annual and perennial species to promote rapid vegetation establishment and blend with the surrounding landscape as soon as possible after the areas are no longer required. Table 2.3 lists the seed mix to be used during initial/interim reclamation activities.

Stockpiles for topsoil, subsoil, mine rock, and site grading spoil materials have been established at the mine site under License to Explore 179LE. Any future topsoil and subsoil stockpiles would be developed based on the suitability of soil materials as determined from soil assessments, for use in future reclamation. The total anticipated volume of topsoil and subsoil stockpiles would be approximately 144,000 cubic yards, and would cover an area of approximately 8 to 10 acres.

All topsoil stockpiles would be protected from disturbance and contamination. Since the project area is subjected to regular southwest winds, topsoil stockpiles would be oriented with the prevailing wind direction where possible to minimize erosion. In addition, snow fences or other wind reduction devices would be used as needed on or near topsoil stockpiles. Stockpiles would be clearly marked with signs.

Table 2.3 Seed Mix for Reclamation of Temporary Disturbance Areas[1], GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[2]

Common Name	Scientific Name	PLS/acre[3]
Western wheatgrass	*Elymus smithii*	4.00
Slender wheatgrass	*E. trachycaulum*	4.00
Streambank wheatgrass	*E. riparium*	4.00
Winterfat	*Krascheninnikovia lanata*	1.00
Wild blue flax	*Linum lewisii*	0.25
Winter wheat	*Triticum aestivum*	20.00

[1] Temporary disturbance areas include all unused portions of the mine site, travelways, power line and pipeline corridors, sediment dam, and topsoil stockpiles.

[2] The given seed mix will not contain noxious weed seeds.

[3] PLS/acre = Pounds pure live seed per acre.

When practical and cost-effective, mine rock, the noneconomic material extracted during the mining of ore, would be stored in worked-out underground mine openings. When such material cannot be placed underground, it would be brought to the surface and placed in the clay-lined, mine rock pile area. Under the Proposed Action, the mine rock pile would be located in the No Name drainage (see Map 1.2) and would primarily contain materials from underground excavations. The mine rock pile could ultimately have a volume of 2-2.5 million cubic yards of material. The pile would cover an area of approximately 37 acres and have a 4:1 slope. A sediment dam and basin (see Section 2.1.2.9) would be constructed below the mine rock pile. Topsoil and subsoil would be removed from the mine rock pile area prior to deposition of the rock. During final reclamation of the mine site area, suitable materials from the mine rock pile may be used as surface overburden in accordance with WDEQ Guideline 1 (WDEQ-LQD 1984).

2.1.2.7 Mine-water Discharge and Treatment

The GMMV estimated mine-water discharge rate is 470 gallons per minute (gpm) (GMMV 1994). Discharge rate estimates for the WDEQ-LQD mine permit range from 470 gpm to 2,400 gpm. The heterogeneity of the sedimentary strata through which the proposed declines would be driven and mining would occur precludes a more accurate estimate of mine-water inflow rates. Because of this uncertainty, the WDEQ-LQD, BLM, and GMMV have agreed to use a discharge rate of 732 gpm as a trigger for further impact evaluation and mitigation (see Section 2.1.2.8). During active mining, mine-water discharge rates would likely increase from levels encountered during decline development and exploration (approximately 170 to 282 gpm), but are not expected to exceed 732 gpm.

Mine-water settling basins, ponds (see Map 1.2), and treatment facilities would initially be over designed and constructed to accommodate 1,300 gpm. Additional basins, ponds, and treatment facilities would be constructed as necessary within the fenced mine site.

Mine-water settling basins for the removal of suspended solids would be constructed underground in the declines as needed. As the settling basins become full they would be shut down and sediments would be removed. If sediments have sufficient uranium content, they would be transported to the Sweetwater Mill for processing; however, if they contain low levels of uranium, they would be deposited underground as backfill and/or be deposited in the mine rock pile.

Overflow from the underground mine-water settling basins would drain to a clear water sump and be pumped through pipelines to the surface mine-water ponds (see Map 1.2). Surface mine-water settling and detention ponds would be designed, lined, and constructed in accordance with applicable WSEO and WDEQ regulations. Ponds would be protected from access by animals by a game fence in accordance with Wyoming Game and Fish Department (WGFD) recommendations.

Mine-water quality would be monitored as identified in the Jackpot Mine Permit Application (GMMV 1994). These water-quality data would be used to determine whether water treatment is necessary prior to discharge. An NPDES permit (#WY-0033952) has already been issued to GMMV under License to Explore 179LE. Clarified water from the mine-water ponds would be treated, if necessary to meet discharge standards for uranium, radium, and other components prior to being discharged into Fourth Creek (see Map 1.2). A second discharge point along No Name Creek is included in the existing NPDES permit in the event that the Fourth Creek drainage cannot accommodate water discharge volumes. Energy-dissipating structures for water discharge points would be designed and sized for the maximum anticipated discharges. In addition, riprap may be installed along steeper channel reaches to prevent erosion. Separate permits would be obtained from the WDEQ, WSEO, and BLM for the construction of applicable hydraulic structures.

If mine-water treatment is required, a separate facility would be constructed at the proposed mine site for the treatment plant. An NRC license would not be required, since the primary purpose of the proposed treatment facility would be to treat mine-water to meet NPDES standards prior to discharge, and radioactive eluates would not be produced on-site.

The removal of uranium and other potential elements of concern from the mine-water would be accomplished by an ion exchange unit. This unit would consist of several skid-mounted, closed vessels filled with ion exchange resin. Once the resin in a vessel becomes full, the loaded resin would be temporarily stored on-site for eventual transportation to the Sweetwater Mill for processing. An amendment to the Sweetwater Mill's Source Material License would be required for this activity. After processing at the mill, the "barren" resin would be transported back to the mine site and reinstalled for further use.

Removal of radium 226 from mine waters would be accomplished by the addition of barium chloride to form an insoluble precipitate of barium sulfate with which radium 226 co-precipitates. Precipitates would settle out in a lined retention pond of sufficient size to allow for adequate precipitation of the barium/radium sulfate. The retention pond would be located at the proposed Jackpot Mine site. The barium/radium sulfate precipitate would not be considered a byproduct material under NRC jurisdiction because it would not be derived from processing the mine-water primarily for its source material (10 CFR 40.4); therefore, the precipitate would either be covered with suitable materials and buried in place upon completion of mining operations, or disposed of at an alternate WDEQ-approved and permitted location.

2.1.2.8 Water and Erosion Monitoring

Water monitoring plans for the proposed project have been developed and include monitoring of surface and groundwater quality and quantity, erosion, and riparian areas; monitoring activities would begin upon project authorization from the BLM and WDEQ. Water monitoring would provide baseline data as well as information identifying potential changes resulting from mining operations. At the end of the first year of mine-water discharge, monitoring data would be assessed, schedules reviewed, and a new monitoring proposal would be prepared for consideration by the WDEQ-LQD. Monitoring locations are shown on Map 2.1.

GMMV, in consultation with WDEQ, has developed monitoring "triggers" designed to identify points at which mitigative actions would be employed. These triggers are based on known existing environmental conditions and are presented below for each of the proposed monitoring parameters.

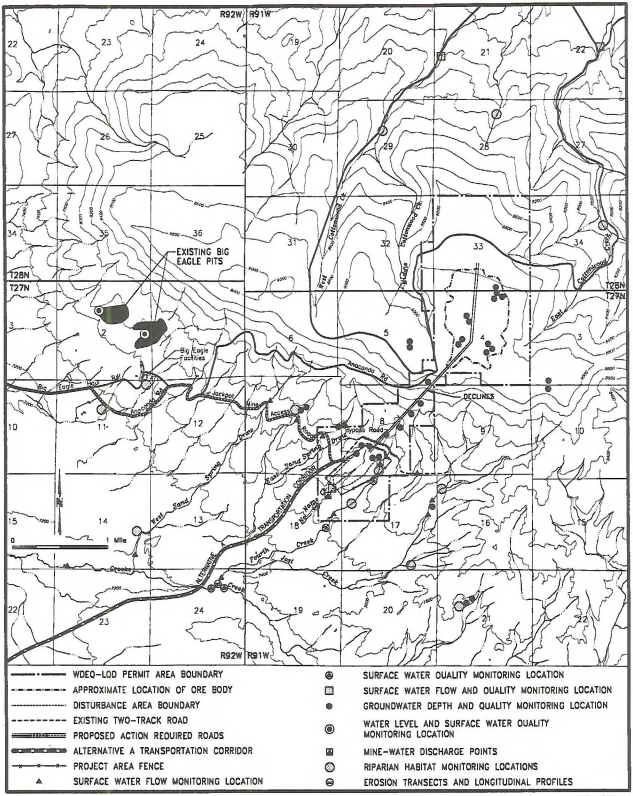
Water-quality Monitoring. Mine-water quality would be monitored prior to discharge and treated as necessary to comply with NPDES permit requirements (see Section 2.1.2.7). If mine-water is of insufficient quality for discharge, it would be treated accordingly to meet NPDES discharge criteria.

A surface and groundwater quality monitoring plan for the proposed mine operations has been developed to measure potential water-quality effects resulting from the proposed operation (GMMV 1994). Chemical water-quality data would indicate if groundwater drawdowns are impacting surface and/or groundwater quality. Map 2.1 shows the location of water-quality monitoring points. Water-quality monitoring frequencies would be as specified in GMMV (1994), and monitoring would include grab sampling for the water-quality parameters listed in WDEQ-LQD Guideline 8, Appendix 2 (WDEQ 1990). All water-quality analyses would adhere to EPA-approved methods (40 CFR 135). In the event that degradation of water quality in existing waterways or in groundwater monitoring wells is noted, the WDEQ would be notified. The BLM and other relevant agencies would be consulted to develop appropriate mitigative/remedial strategies.

Water-quantity Monitoring. Surface water flow rates and water levels in groundwater wells and at the existing pits at the Big Eagle Mine would be monitored as specified in GMMV (1994). Monitoring locations are presented on Map 2.1. Surface water flow volumes in East Cottonwood Creek, the West Fork of Middle Cottonwood Creek, and in unnamed gullies within one mile of the decline portals would be monitored each year for the three consecutive months of August, September, and October. These months were chosen since total stream flows during this period approximate base flows. (Base flow is the portion of a stream's flow contributed by springs, seeps, and other gravity-driven groundwater movement.) The purpose of the monitoring would be to determine whether base flow changes occur that can be subsequently attributed to mine dewatering activities. Surface water flows would be monitored quarterly on Crooks Creek, Sand Springs, and Fourth Creek (see Map 2.1).

Mine-water discharge/flow rates into Fourth Creek would be monitored using a continuous recording device. Monitoring would be used to evaluate whether actual discharge rates exceed predicted rates. A trigger level for mine-water discharge has been set at 732 gpm, and should discharge rates exceed 732 gpm for 30 consecutive days, WDEQ would be consulted and alternate discharge points and associated control structures would be developed as necessary to ensure that surface water flows in the existing channel do not exceed channel capacity and cause undesirable erosional and water-quality impacts.

Groundwater levels would be monitored to determine whether drawdowns around the portals and declines could adversely affect wetlands in nearby drainages. Trigger levels for groundwater monitoring wells have been set to a drawdown limit of five feet, since declines in groundwater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Big Eagle Facilities
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3
West Cottonwood Ck.
Middle Cottonwood Ck.
East Cottonwood Creek
Big Eagle Haul Rd.
Anaconda Rd.
Jackpot Mine Access Road
Bypass Road
DECLINES
10
11
12
8
9
10
Draw
Spring
East Sand Spring Draw
TRANSPORTATION CORRIDOR
15
14
13
18
No Name Ck.
17
16
15
West Sand Spring
0
1 Mile
Crooks Creek
ALTERNATIVE
Fourth of July Creek
Lost Creek
22
23
24
19
20
21
22
WDEQ-LQD PERMIT AREA BOUNDARY
APPROXIMATE LOCATION OF ORE BODY
DISTURBANCE AREA BOUNDARY
EXISTING TWO-TRACK ROAD
PROPOSED ACTION REQUIRED ROADS
ALTERNATIVE A TRANSPORTATION CORRIDOR
PROJECT AREA FENCE
▲ SURFACE WATER FLOW MONITORING LOCATION
SURFACE WATER QUALITY MONITORING LOCATION
SURFACE WATER FLOW AND QUALITY MONITORING LOCATION
● GROUNDWATER DEPTH AND QUALITY MONITORING LOCATION
◉ WATER LEVEL AND SURFACE WATER QUALITY MONITORING LOCATION
MINE-WATER DISCHARGE POINTS
RIPARIAN HABITAT MONITORING LOCATIONS
⊖ EROSION TRANSECTS AND LONGITUDINAL PROFILES
1007\MAPS\MAP-2-1

Map 2.1 Riparian/Water Monitoring Locations, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

levels greater than five feet could potentially affect local streams, springs, seeps, and wetlands. If drawdown levels exceed five feet, GMMV would initiate consultations with the WDEQ and BLM to determine if drawdowns have resulted in surface impacts, and what, if any, mitigation measures should be applied. Mitigation options may include water injections to increase groundwater levels; increased monitoring of spring, stream, and seep flows, and/or wetlands to show whether drawdowns are affecting these resources; surface water discharge to affected springs, streams, seeps, and wetlands; and other measures as outlined in GMMV (1994).

Erosion Monitoring. Erosion transects have been installed in accordance with WDEQ-LQD specifications at locations on Fourth and No Name Creeks (see Map 2.1) (GMMV 1994). Transects consist of a series of iron stakes located along a line perpendicular to the channel and driven into the sides and bottom of the channel. The relative elevations and height of the top of the stakes above ground level have been measured and recorded as baseline values. The distances from the top of stake to ground would be measured quarterly on all stakes. In addition, the absolute elevations of the stakes would be determined periodically.

Erosion transect monitoring would provide a gauge of soil loss on Fourth and No Name Creeks. Excessive erosion within stream channels (i.e., greater than one foot) would trigger mitigation efforts to reduce continued soil erosion and loss of vegetation. In addition, the amount of cutbanks or scouring would be monitored quarterly by measuring the length of bare ground along representative portions of the stream channel (i.e., longitudinal profiles) at or near erosion transect locations. Mitigation measures would be implemented as directed by WDEQ and/or the BLM and may include development of alternate mine-water discharge points to reduce channel flow rates, use of in-channel velocity reduction structures, use of riprap to slow water velocities and prevent erosion, and/or streambank revegetation to enhance soil stability.

2.1.2.9 Diversions, Sediment Basin, and Dam

The sediment basin and dam would be built to applicable WDEQ, WSEO, and BLM standards, and separate permits from these agencies would be obtained prior to basin and dam construction. The design criteria and construction plans for the dam would be prepared by a Certified Professional Engineer.

The sediment basin associated with the mine rock pile would be designed and constructed to capture all meteoric waters from disturbed areas of the mine site and isolate these waters from any existing surface and subsurface waters. Meteoric waters would be diverted from disturbed areas by the use of revegetated permanent diversion ditches with 3:1 sideslopes, culverts, and other appropriately engineered structures. The sediment dam and basin would be designed for zero discharge under normal operating conditions. Provisions for discharging water from storm events would be provided for waters meeting NPDES requirements. An additional permanent diversion ditch for routing ephemeral flows in the No Name drainage around disturbed areas at the mine site would also be constructed and revegetated. All affected areas associated with diversions and the dam and basin would be topsoiled and revegetated in a timely manner.

2.1.2.10 Acid Generation Potential

A study to assess the acid generation potential (AGP) of the proposed Jackpot Mine operations and to develop appropriate future monitoring measures has been completed: *Report on the Sampling and Analysis Program for Assessment of Acid Generation Potential of Waste Rock Materials from Mine Decline Development, Jackpot Mine, Green Mountain Mining Venture, Jeffrey City, Wyoming* (Kea Pacific Holdings, Inc. [KPH] 1993). The report presents the basis for and details of a sampling and analytical program to evaluate and quantify AGP prior to and during development of the Jackpot Mine. The sampling and analysis program was designed so that future analysis, conducted during mine development and operations, would be compatible with existing data.

The AGP from mine waste rock is primarily a function of the presence and reactivity of sulphide minerals relative to the availability of minerals that neutralize acidity (KPH 1993). If the acid neutralization potential (ANP) to AGP ratio (i.e., ANP:AGP) exceeds 3:1, the waste sample is determined non-acid producing. KPH (1993) found only small quantities of sulphur in 63 representative samples collected from probable mine waste rock materials at the Jackpot Mine site. Additionally, high ANP:AGP ratios occurred in 85% of the samples, indicating that acid generation is not a potential issue with Jackpot Mine rock materials.

Monitoring of the AGP from mine waste rock would be conducted during development of the Jackpot Mine. Cuttings generated during decline development would be sampled for ANP and AGP every 100 feet for a total of approximately 120 samples. In the unlikely event that monitoring reveals a significant potential for acid generation from mine waste rock materials, appropriate mitigation measures would be applied (e.g., further isolation of potential acid generating materials, application of neutral and/or buffer materials to the mine waste rock pile).

2.1.2.11 Waste Disposal and Sewage Treatment

Waste products from the proposed mining operation would be minimized through recycling of materials to the fullest practical extent. All solid waste products generated by the proposed mining operation would be disposed of in accordance with WDEQ Solid Waste Management Rules.

The sewage treatment system at the Big Eagle facilities, which consists of septic tanks and a drain field, would be used to the maximum extent possible for the proposed project. An additional sewage treatment system (i.e., septic tank and drain field) would be constructed to service surface facilities at the proposed Jackpot Mine site. Underground sanitary facilities would consist of portable toilets that would be regularly pumped out. All underground waste from the portable toilets would be transported to the surface and disposed of in the septic systems or at another appropriate facility. A WDEQ-WQD permit to construct the sewage treatment system would be obtained prior to construction.

2.1.2.12 Mine Access and Ore Transport

Access to the mine site would be controlled by the erection of a six-foot chain-link fence surrounding the Jackpot Mine facilities (see Map 1.2). Lockable gates would be installed at appropriate locations, and signs would be erected indicating no admittance to unauthorized personnel.

Conveyors are proposed for underground use in the mine to transport the extracted ore and mine rock from the working areas to the surface. At the surface, mine rock and ore likely would be handled with a conveyor/stacker system or by dump trucks.

Ore extracted at the proposed mine would initially be stockpiled on the surface within the WDEQ-LQD permit area, prior to transport to the Sweetwater Mill. Stockpiled ore would be hauled approximately 37 miles via covered trucks along the existing Jackpot Mine Access Road, Anaconda Road, Big Eagle Haul Road, and the Crooks Gap Wamsutter Road (Fremont County Road No. FR-318 and Sweetwater County Road No. 4-23) (see Map 1.3). An existing two-track road connecting the Sweetwater Mill with the Crooks Gap Wamsutter Road would be upgraded to provide access to the mill by ore haul trucks.

The Jackpot Mine Access Road to the site has been constructed under License to Explore No. 179LE (see Map 1.2). Pursuant to the 1872 Mining Law, a BLM ROW is not required. This road has been constructed following guidelines specified in the BLM *Road Standards Manual*, Section 9113 (BLM 1985, 1991); all additionally required roads and road upgrades would also adhere to these guidelines. Safety berms and associated openings, culverts, and drop structures would be employed as necessary and would comply with BLM specifications.

Since the Jackpot Mine Access Road, Anaconda Road, Crooks Gap Wamsutter Road, and Mill Access Road would be used for ore hauling, these roads would be widened to accommodate a 32 to 36-foot running surface. The existing Big Eagle Road was initially constructed to provide for ore hauling, and would not require widening for the proposed project. Where possible, all road-widening activities would be conducted in a manner to minimize the area of ground disturbance; however, for the purpose of this analysis, it is assumed that the entire 100-foot easement widths for all roads requiring upgrades would be disturbed during construction, and that 60 feet of disturbance would remain for the LOP (see Table 2.1). Some existing road disturbance would be reclaimed to minimize LOP disturbance along project-required roads. A ROW for the Anaconda Road has already been granted by the BLM. The existing public road (two-track road) across the mine site would be rerouted around the mine to allow continued public access (see Map 1.2).

Regular maintenance of all roads required for the proposed project would be performed by GMMV during hauling activities and would include snow removal, road grading, and fugitive dust suppression. Resolutions have been obtained by GMMV from Fremont and Sweetwater Counties approving the potential future use of the Crooks Gap Wamsutter Road for ore-hauling activities (personal communications, Board of County Commissioners, Sweetwater County and Office of the Fremont County Commissioners, November 1992). As specified in these resolutions, GMMV would work with County Engineers and Planners to ensure that required road improvements are in accordance with the appropriate upgraded road design.

2.1.2.13 Power Transmission, Communication Lines, Gas Pipeline

A 34.5 kV overhead power line connecting the mine site to power lines located approximately four miles southwest of the area has already been constructed for the proposed project under the License to Explore 179LE (see Map 1.2). The power line was constructed under the supervision of Pacific Power and Light Company and is in compliance with guidelines established in Olendorff et al. (1981) to prevent potential adverse effects to raptors. An electrical power substation has also been constructed at the site, and consists of a concrete slab for transformer mounting enclosed by a six-foot chain-link fence. Appropriate safety signs are posted at the substation. The substation would be modified, if necessary, to accommodate the permanent electrical power requirements of the Jackpot Mine. Electrical equipment containing polychlorinated biphenyls (PCBs) would not be used for the project.

The existing Big Eagle facilities are served by Mountain Bell Telephone Company. Telephone services from the Big Eagle facility would be extended to the Jackpot Mine site through buried lines within and parallel to the Anaconda and Jackpot Mine Access Road easement areas. Authorization for the lines would be obtained from the BLM prior to construction.

Natural gas service to provide heating at the proposed mine facilities would be supplied by Northern Gas of Wyoming by extending a currently existing service line from the Big Eagle facilities to the proposed mine site. The service line would be buried within and parallel to the Anaconda and Jackpot Mine Access Road easement areas. Authorization for the proposed service line would be obtained from the BLM prior to installation.

2.1.2.14 Employment and Employee Access

It is anticipated that a maximum of 200 to 250 GMMV employees would be required for the proposed project. An additional 25 contract employees may also be required annually during mine construction and operation. Table 2.4 summarizes the estimated number of employees and contract workers required during each year of mine operation. If possible, all employees would be hired locally. It is estimated that in-migrants may constitute as many as 63 of the total number of employees. Employees would probably reside in Jeffrey City, Lander, or Riverton (see Map 1.1).

The proposed mine plan anticipates utilizing the existing Sweetwater Mill for ore processing. Approximately 20 to 30 additional employees would be required at the Sweetwater Mill. Mill employees would likely reside in Rawlins, Wyoming (Kennecott 1994).

Since all employees would use their own transportation to the existing Big Eagle facilities and the mine would operate up to three shifts daily during production operations, as many as 50 vehicles could be present on the existing Big Eagle Haul Road at any given time. GMMV would provide transportation in the form of buses or other vehicles from the Big Eagle facility to the Jackpot Mine site.

2.1.2.15 Hazardous Materials

As mandated under BLM Instruction Memoranda Nos. WO-93-344 and WY-94-059, all NEPA documents must list and describe any hazardous or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. Hazardous materials are those chemicals listed in the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*; extremely hazardous materials are those defined in 40 CFR 355. Hazardous materials anticipated to be used or produced during the implementation of this Proposed Action are categorized as follows:

- fuels - gasoline (potentially containing benzenes, toluene, xylenes, methyl-tert-butyl ether, and tetraethyl lead), diesel fuel, and natural gas;
- antifreeze - ethylene glycol;
- combustion emissions - nitrogen oxides (NO_x) and polynuclear aromatic hydrocarbons;
- mine emissions - radon;
- lubricants - grease (potentially containing polynuclear aromatic hydrocarbons and lithium compounds) and motor oil;
- mine production products - uranium and trace metals;
- mine discharge water - containing small quantities of potentially hazardous substances (e.g., chlorides, sulfates, trace metals) (see Section 3.1.5.2);
- mine-water treatment agents - barium compounds;
- explosives - ammonium nitrate;
- cement additives; and
- miscellaneous materials - paints, solvents, fertilizers, and herbicides.

Further, specific information regarding the types and quantities of hazardous materials, as well as their production, use, storage, transport, and disposal for the proposed project, is provided in the Hazardous Materials Summary (HMS) for the proposed project (see Appendix A).

Extremely hazardous materials potentially produced, used, stored, transported, or disposed of as a result of the proposed project include ammonia in produced water, tetra ethyl lead in gasoline, and hydrogen sulfide in natural gas. In addition, some extremely hazardous materials would likely be present in combustion emissions (e.g., nitrogen dioxide [NO_2], sulfur dioxide [SO_2]). Combustion emissions would be regulated by the WDEQ-AQD and EPA and would not exceed authorized limits. Mine water would be treated, as necessary, and discharged in accordance with all applicable BLM, WDEQ-WQD, and NPDES rules, regulations, and standards (see Section 2.1.2.7).

Table 2.4 Estimated Employee and Contract Worker Requirements for the GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Year	Mine Employees	Contract Workers
1	30	--
2	75	--
3	125	25
4	175	25
5	200-250	25
6	200-250	25
7	200-250	25
8	200-250	25
9	200-250	25
10	200-250	25
11	200-250	25
12	200-250	25
13	200-250	25
14	200-250	25
15	200-250	25
16	200-250	25
17	175	25
18	125	25
19	100	25
20	75	25
21	50	--
22	25	--

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[1] Employee and contract worker numbers may vary depending on the mining methods ultimately selected (see Section 2.1.2.4).

All production, use, storage, transport, and disposal of hazardous or extremely hazardous materials as a result of this project would be in strict accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. Notice of any spills or leakage (i.e., undesirable event) would be immediately given by GMMV to the Authorized Officer (AO) or other such federal and state officials as are required by law. All project-related activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials would be conducted in such a manner as to minimize potential environmental impacts. In addition, GMMV shall have a *Spill Prevention Control and Countermeasure Plan* (SPCCP) in place prior to project implementation.

2.1.3 Riparian Habitat Enhancement and Monitoring

GMMV proposes to establish a riparian habitat enhancement and monitoring program concurrently with the development of the proposed project. While GMMV does not anticipate impacts to riparian resources resulting from drawdown or dewatering effects, they nonetheless would like to take proactive steps to enhance the riparian habitat resources on approximately 20 acres of Green Mountain on either private or public lands. Riparian habitat enhancement and monitoring measures would be as specified in GMMV (1994) and would be developed on a site-specific basis by GMMV in consultation with the BLM, WGFD, WDEQ, and other relevant agencies and individuals (e.g., grazing lessees). These riparian enhancement projects would be authorized independently of the Plan of Operations for the proposed Jackpot Mine, and site-specific environmental analyses would be conducted for each proposed enhancement project.

Riparian habitat enhancement measures would emphasize project permanence and projects that require low-level to no long-term maintenance. In addition, these measures would minimize land-disturbing activities and their priorities would be based on compatibility with existing land uses. It is likely that BLM-approved fencing would be used as a component of riparian habitat enhancement, since fencing can provide for notable improvements in riparian forage production within just a few years.

Riparian habitat monitoring would be conducted on areas that could potentially be impacted by drawdown as well as locations outside potential drawdown areas (see Map 2.1). Monitoring would be designed and implemented to determine whether mining activities are affecting long-term changes in wetland characteristics within the potential drawdown area. Additionally, monitoring would be conducted on riparian enhancement sites to determine the effectiveness of enhancement measures. Monitoring parameters would likely include vegetation characteristics, water quality and quantity components, and wildlife use information.

Trigger levels for mitigative action to riparian habitats would include any indication that negative changes in riparian areas have occurred or are occurring, including but not limited to water level changes and/or loss or lessened abundance of riparian vegetation. To ensure no net loss of wetlands, mitigation measures to restore or create new riparian areas would be developed in consultation with the BLM, WDEQ, WGFD, and other relevant agencies and/or individuals.

2.1.4 Life of Project and Project Schedule

At the proposed ore production rate of 3,000 tpd, identified uranium ore resources at the mine would support a mine operating life of 10 to 15 years. The total duration of construction, exploration, standby, mining, and reclamation activities would likely be from 13 to 25 years (Table 2.5); three years of standby is included to allow for delays in the actual startup of mining due to uranium oxide market factors. At a maximum, mine and facilities construction would be initiated within 5 years of initial underground exploration (i.e., extending the declines). Market factors and future exploration for additional uranium ore resources from the proposed underground workings could

Table 2.5 Projected Duration of Project Activities, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Project Activity	Duration[1] (years)
Underground exploration and related facilities construction	1-2
Standby period[2]	0-3
Mine and related facilities construction	1-2
Ore extraction	10-15
Reclamation	1-3
LOP	13-25

[1] Market factors and future exploration for additional uranium resources from the proposed mine workings could increase or decrease the mine operating life.

[2] GMMV is recommending that an additional three years be added to the LOP to account for possible delays in project startup due to uranium oxide market factors.

increase or decrease the mine operating life. In the event that mine and facilities construction is not initiated within 5 years of underground exploration and/or proposed extraction operations are not completed within 22 years of project authorization, further NEPA analyses would be conducted. Interim WDEQ-LQD mine stabilization measures as specified in WDEQ-LQD non-coal regulations would be applied after 5 years of the initiation of underground exploration if mine and facilities construction has not occurred. At this point the BLM would review GMMV's submittals of WDEQ-LQD requests and interim mine stabilization plans to determine whether unnecessary and undue degradation would occur. Actual ore production rates may vary from the proposed rate due to unforeseen conditions encountered during mining, the capacity of the ore processing facility (i.e., the Sweetwater Mill), and market factors.

2.1.5 Reclamation

Reclamation would be conducted on all disturbed areas in compliance with the BLM *Wyoming Policy on Reclamation* (BLM 1990b) and procedures identified in the GMMV Reclamation Plan (GMMV 1994). The currently proposed Reclamation Plan is provided as Appendix B to this EIS. While the Reclamation Plan has not yet been approved by the WDEQ, and therefore may be subject to change during the mine permitting process, the proposed project has been planned to minimize disturbance, and appropriate restoration and reclamation activities would be ongoing throughout the LOP. The short-term reclamation goal would be to stabilize disturbed areas as rapidly as possible, thereby protecting sites and adjacent undisturbed areas from degradation. The long-term goal would be to return the land to conditions approximating those which existed prior to disturbance.

In general, the goals of the Reclamation Plan would be:

- to stabilize disturbed areas to prevent erosion and sedimentation on both a short- and long-term basis;
- to reestablish productive vegetation and wildlife habitat consistent with predevelopment conditions and the accepted land use; and
- to achieve a visual compatibility with the surrounding landscape.

Reclamation would occur during two phases of the proposed project. Initially, transportation corridor easement areas would be partially reclaimed after corridor construction has been completed (see Section 2.1.2.12). This initial reclamation would reduce the amount of disturbed area to only that necessary for project operations. Upon project completion, all remaining disturbed areas, except roads designated to remain for other purposes, would be reclaimed. Roads, impoundments, and the mine site would be reclaimed. The power lines and poles would be removed, and the gas pipeline would be purged of combustible products and retired in place or removed.

Upon closure of the mining operation, all buildings and related facilities would be removed, and all unsalvageable materials would be disposed of at authorized sites. Concrete foundations would be broken up and either placed in the mine workings or buried on-site. Regrading, topsoiling, and revegetation of all disturbed land areas would be completed. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed. Compacted areas would be thoroughly ripped 12 to 18 inches deep before topsoil is replaced. The proposed seed mixture or other mixture as approved by WDEQ and the BLM would be broadcast or drill-seeded. Further detail on proposed seed mixtures and reclamation specifics is provided in the Reclamation Plan (Appendix B).

2.1.6 Applicant-committed Mitigation Measures

In addition to the water monitoring and riparian enhancement measures presented in Sections 2.1.2.8 and 2.1.3 and reclamation criteria specified in Appendix B, GMMV proposes to implement the following mitigation measures, design features, and procedures to avoid or mitigate project impacts. These mitigation measures and design features may be waived when deemed appropriate by the BLM AO if a thorough analysis determines that the resource for which the measure was developed would not be impacted.

1. All mitigation measures identified in this EIS would be adhered to on federal, state, and private lands, subject to landowner preferences or agreements with GMMV.
2. Road-widening and site development activities would be conducted to minimize disturbances in areas sensitive to wildlife habitat and/or of high recreational value, including wetlands and riparian areas.
3. Areas with high erosion potential would be avoided, where possible (i.e., steep slopes, floodplains, landslide areas, dunes, unstable soils).
4. Surface disturbance and/or occupancy would not occur on slopes in excess of 25%, nor would construction occur where soil is frozen or saturated or when watershed damage is likely, unless an adequate plan is submitted to the BLM that demonstrates potential impacts would be mitigated.
5. Roads not required for the operation and maintenance of the proposed project would be permanently blocked, recontoured, reclaimed, and revegetated.
6. To avoid potential land use conflicts, coordination with oil and gas lessees and grazing permittees in the area would occur prior to mine development.
7. Removal or disturbance of vegetation would be kept to a minimum through

planning and construction site management (e.g., by utilizing previously disturbed areas, using existing ROWs and easements, designating limited equipment/materials storage yards and staging areas, etc.).

8. Sufficient topsoil to facilitate revegetation would be segregated from subsoils during all surface construction operations and would be returned to the surface upon completion of operations. Topsoil stockpiles would be revegetated or otherwise protected to prevent erosion and maintain some soil microflora and microfauna.
9. Removed vegetation would be replaced with plants of equal value (i.e., species that have similar forage value and growth form to plants originally growing on the site), using procedures which would include the following:
   - ripping of compacted soils from 12 to 18 inches deep prior to reseeding;
   - employment of drill or broadcast reseeding procedures;
   - fall reseeding (September 15 to freeze-up), where feasible;
   - spring reseeding (prior to April 15) if fall reseeding is not feasible;
   - utilization of native cool season grasses, forbs, and shrubs in a mixture specified by the WDEQ-LQD and BLM;
   - addition of BLM-approved introduced/adapted species (e.g., crested wheatgrass, Russian wild rye, winter wheat, etc.) to the seed mix to facilitate site stabilization, and/or if after all attempts at vegetation reestablishment with native species are unsuccessful, as determined during monitoring;
   - use of seed mixes which are free of noxious weeds;
   - installation of waterbars on disturbed slopes as necessary;
   - fencing of sensitive reclamation sites (e.g., riparian and dunal areas), as determined necessary by the BLM; and
   - where appropriate, implementation of BLM-approved weed control techniques (e.g., biological controls, herbicides).
10. Vegetation and soil removal would be accomplished in a manner that would minimize erosion and sedimentation.
11. Surface disturbance of perennial, intermittent, and ephemeral water courses and/or wetland and riparian areas would be avoided, where possible.
12. Where wetlands and riparian areas, streams, or ephemeral stream channels must be disturbed, COE 404 Permits would be obtained as necessary, and the following measures would be employed:
   - road-widening activities would occur at wetland crossings during dry conditions (i.e., late summer, fall, or dry winter periods), and winter construction activities would only occur prior to soil freezing or after soils have thawed;
   - streams, wetlands, and riparian areas disturbed during project construction would be restored to pre-project conditions;
   - perennial water crossings and facilities proximal to open waters would not be constructed during important fish spawning periods;
   - stream beds would be crossed perpendicular to flow, where possible;
   - wetland topsoil would be selectively handled;
   - recontouring and BLM-approved appropriate/adapted species would be used to revegetate the banks to aid in soil stabilization; and
   - revegetation operations would begin on impacted areas immediately after completion of project activities.
13. Current water uses on and adjacent to the project area would be protected

from project impacts. Project activities would be conducted to minimize adverse effects on water quality and quantity, as required by federal and state regulations.

14. Erosion control measures such as riprap, energy dissipators, mulch, jute netting, or other appropriate methods would be used on unstable soils, steep slopes, wetland areas, and/or other locations with high erosion potentials to prevent accelerated soil erosion and sedimentation.
15. Waste rock materials would be monitored for AGP during decline development following procedures identified in KPH (1993). In the unlikely event that monitoring reveals a significant potential for acid generation from waste rock materials, appropriate mitigation measures would be applied.
16. Air quality in the area would be maintained through compliance with the WDEQ-AQD permit (e.g., watering and/or treatment of exposed surfaces to minimize fugitive dust emissions) and EPA radon-monitoring provisions.
17. Prior to and within one year of the beginning of any construction activity, the area would be surveyed in late winter and early spring to identify active raptor nests. Active raptor nest sites would be avoided during the nesting season (February 1 through July 31). If an active nest area must be impacted, project activities would occur outside the nesting season, and consultation with the USFWS, WGFD, and BLM would be conducted.
18. Aboveground power lines would be constructed following guidelines established in Olendorff et al. (1981) to prevent potential adverse impacts to raptors.
19. Prior to and within one year of the beginning of any construction activity, areas designated by the BLM would be surveyed for sage grouse leks in late winter and early spring. Active and historic sage grouse leks and adjacent lands would be avoided during the breeding and nesting seasons (i.e., March 1 through June 30). Where possible, no construction activities would be conducted on public lands within 0.25 mile of known active lek sites. To minimize disturbance of breeding sage grouse along the proposed transportation corridor, no project-related ore-hauling activities would occur during the period from one hour before dawn until 9:00 a.m. during the grouse breeding season (i.e., March 1 through April 30).
20. No construction activities would occur on crucial winter ranges or elk calving areas as designated in this EIS.
21. Paleontological and archaeological field checks by BLM or other authorized personnel would occur prior to disturbance as deemed appropriate by the BLM. Monitoring during surface-disturbing activities would be conducted by a BLM-approved archaeologist or paleontologist, as deemed appropriate by the BLM. Paleontological or cultural resource sites would be avoided or mitigated as necessary prior to disturbance. Any cultural or paleontological resource discovered by GMMV or any person working on their behalf would be immediately reported to the BLM, and all operations that may further disturb such resources would be suspended until written authorization to proceed is issued by the BLM AO. An evaluation of the discovery would be made by the BLM to determine

appropriate actions to prevent the loss of significant resources.

22. Construction and facilities would be in conformance with Visual Resource Management (VRM) objectives for the VRM classes on the area, and all facilities would be located to minimize disturbance of the visual horizon and painted to blend with the surrounding landscape.
23. Noise disturbance would be minimized by keeping all internal combustion engines adequately muffled and maintained.

2.2 OTHER ALTERNATIVES

The Proposed Action, four project development alternatives, and the No Action Alternative have been assessed in this EIS. Implementation of the proposed project may be conducted using a combination of the alternatives presented, or may be denied as specified under the No Action Alternative.

2.2.1 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Project activities as described for the Proposed Action would be essentially the same under implementation of Alternative A except a new transportation corridor linking the proposed Jackpot Mine Site with the Sweetwater Mill would be constructed, thereby reducing the distance required for ore-hauling and traffic along the Crooks Gap Wamsutter Road (see Map 1.3). In addition, GMMV would reclaim some existing road disturbance areas at locations as identified by the BLM. Under Alternative A, no upgrades to the Crooks Gap Wamsutter Road or the existing two-track road linking the mill site to the Crooks Gap Wamsutter Road would be conducted. To provide suitable access to the proposed Jackpot Mine site, road upgrades would be conducted as under the Proposed Action on the Anaconda and Jackpot Mine Access Roads.

The Alternative A transportation corridor would be constructed primarily along existing two-track roads and power line ROWs presently occurring on the area; only approximately 4 miles of the road would be constructed on previously undisturbed lands. Under Alternative A the ore-hauling distance would be reduced from the approximately 37.4 miles for the Proposed Action to 21.7 miles. The reduced hauling distance would result in reduced project impacts caused by ore-hauling (e.g., fugitive dust and internal combustion emissions, public safety along existing county roads, wildlife disturbance and mortality), and would reduce the amount of cumulative land disturbance in the vicinity of the project since some existing road disturbance would be reclaimed. Total new ground disturbance would be increased from 289 acres for the Proposed Action to 387 acres for Alternative A (see Table 2.1). LOP ground disturbance would be reduced from the 418 acres required for the Proposed Action to 372 acres. Mitigation measures as described for the Proposed Action would be applied under Alternative A.

2.2.2 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Project activities as described for the Proposed Action would be essentially the same under implementation of Alternative B, except a new transportation corridor linking the Big Eagle Haul Road to the Crooks Gap Wamsutter Road would be constructed, thereby reducing the distance required for ore-hauling (see Map 1.3). Under Alternative B, there would be no upgrades to the northern portions of the Crooks Gap Wamsutter Road. To provide suitable access to the proposed Jackpot Mine site and Sweetwater Mill, road upgrades would be conducted as under the Proposed Action on the Anaconda, Jackpot Mine Access, and Mill Access Roads.

The Alternative B transportation corridor would be constructed across approximately 4.1 miles of previously undisturbed lands. Under Alternative B, the ore-hauling distance would be reduced from the approximately 37.4 miles for the Proposed Action to 30.9 miles. Reduced ore transport requirements would result in reduced impacts as for Alternative A. Total new ground disturbance would be 312 acres and LOP disturbance would be 404 acres (see Table 2.1). Mitigation measures as described for the Proposed Action would also be applied under Alternative B.

2.2.3 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Project activities as described for the Proposed Action would be essentially the same under implementation of Alternative C, except a new transportation corridor linking the Crooks Gap Wamsutter Road to the Sweetwater Mill site would be constructed, thereby reducing the distance required for ore-hauling (see Map 1.3). Under Alternative C, there would be no upgrades to the southern portion of the Crooks Gap Wamsutter Road or the existing two-track road connecting the mill to the Crooks Gap Wamsutter Road. To provide suitable access to the proposed Jackpot Mine site, road upgrades would be conducted as under the Proposed Action on the Anaconda and Jackpot Mine Access Roads.

The Alternative C transportation corridor would be constructed across approximately 4.3 miles of previously undisturbed lands. Under Alternative C, the ore-hauling distance would be reduced from the approximately 37.4 miles for the Proposed Action to 35.2 miles. Reduced ore transport requirements would result in reduced impacts as for Alternatives A and B. Total new ground disturbance would be 290 acres, and LOP disturbance would be 404 acres (see Table 2.1). Mitigation measures as described for the Proposed Action would be applied under Alternative C.

2.2.4 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Project activities as described for the Proposed Action would be essentially the same under implementation of Alternative D, except that mine waste rock from the proposed Jackpot Mine would be placed in an existing pit at the Big Eagle Mine site, thereby reducing the size of the disturbance area at the Jackpot Mine site and facilitating reclamation of the Big Eagle Mine (see Map 1.2). Road upgrades under implementation of Alternative D would be conducted as with the Proposed Action.

Under Alternative D, approximately 2,000,000 cubic yards of mine waste rock would be transported in covered 100-ton trucks from the Jackpot Mine site over the Jackpot Mine Access Road and a portion of the Anaconda Road (approximately 3.5 miles) to an existing pit at the Big Eagle Mine site. Placement of the mine waste rock in an existing Big Eagle pit would assist in the final goals of reclamation for the Big Eagle Mine, thereby facilitating reduced regional cumulative impacts. Implementation of Alternative D would reduce the amount of surface disturbance required at the Jackpot Mine site from approximately 41.8 acres to 10.0 acres, a smaller sediment basin and dam would be required, the potential for acid generation would be eliminated, and approximately 0.6 acres of riparian scrub that would be impacted under the Proposed Action would remain undisturbed. While the amount of disturbance at the Jackpot Mine site would be reduced from that of the Proposed Action under this alternative, the inclusion of existing disturbance at the Big Eagle Mine (i.e., the existing pit and pit access areas--approximately 96.7 acres) would increase the amount of area required for this alternative. Total LOP ground disturbance required under this alternative would be increased from 418 acres, for the Proposed Action to 515 acres. Newly required disturbance under Alternative D, including the entire fenced Jackpot Mine site, would occur on the same areas and occupy the same acreage as that of the Proposed Action (289 acres). Mitigation measures as described for the Proposed Action would be applied under Alternative D.

2.2.5 No Action

NEPA requires that a No Action Alternative be considered in all environmental documents. For the GMMV Jackpot Mine Project, the No Action Alternative would involve the disapproval of the Plan of Operations for the Jackpot Mine and allow no further development of GMMV's Proposed Action beyond levels allowed in License to Explore 179LE. The Plan of Operations would be returned to GMMV stating the reasons for rejection and requesting the proponent to submit a new plan that would meet the environmental and/or administrative constraints. Whereas the BLM can require reasonable environmental controls in an operating plan, it does not have the authority to disapprove a reasonable operating plan for a mining operation which would be conducted in a reasonable and environmentally responsible manner in areas that are open to mineral entry (General Mining Law and 36 CFR 228). The use of the No Action Alternative, however, is consistent with previous BLM administrative decisions and CEQ guidelines to treat this alternative as the no project option. It provides a baseline against which other options can be compared.

2.3 ALTERNATIVES CONSIDERED BUT REJECTED

Eight additional mining method/facilities siting alternatives and an additional ore transport alternative, were considered but rejected for the proposed project early in the planning process. Table 2.6 lists these alternatives and identifies the criteria used for alternative rejection.

2.4 SUMMARY OF ENVIRONMENTAL IMPACTS

A summary of impacts and mitigations for the Proposed Action and alternatives is presented in Table 2.7. The impacts presented in this table are primarily considered unavoidable. Further details on impacts and mitigation measures of the Proposed Action and alternatives are presented in Chapters 4.0 and 5.0.

Table 2.6 Alternatives Considered But Rejected, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Alternative	Rejection Criteria
Uranium resource definition through surface drilling	• Approximately 1,000 acres of disturbance required • Excessive cost (approximately $150 million) • Imprecise definition of reserve locations
Shaft access to mine from directly above the ore body	• Haul and access roads through important wildlife habitat and recreation areas and increased road miles • Safety concerns due to steep grades for haul trucks, construction vehicles and other traffic • Secondary mine escapeway required • Additional ventilation entries required • Increased capital and operational cost • Shaft area subject to increased adverse weather conditions • Increased technical complexity of mine surface facilities due to soil, subsoil, and groundwater conditions (e.g., additional fill materials required, additional pumping costs, longer haul routes)
Locate declines within the Fourth Creek drainage	• Increased surface water within the drainage (i.e., Fourth Creek is an intermittent drainage) • No suitable location for the mine rock pile • Increased haul and access road lengths • Increased impacts to jurisdictional wetlands • Increased technical complexity of mine surface facilities
Reopen Big Eagle Mine and/or access from Big Eagle Mine to Jackpot Ore Reserve	• Extensive exploration drilling program required • No proven uranium resource reserves delineated at Big Eagle Mine • Probable reserves would be less that 0.1% uranium at Big Eagle Mine • Declines would be approximately 1.7 mi longer, and cost approximately $14 million more to construct than the Proposed Action, precluding economic ore extraction • Potential increased inflows of approximately 103 gpm due to increased decline lengths
In situ solution mining	• Adverse drilling conditions and excessive drilling expenses • Depth of the ore bodies • Insufficient permeability and lack of hydraulic continuity (e.g., lensoid nature of strata resulting in low extraction rates) • No containment strata identified
Use of conventional long-wall or short-wall mining techniques	• Insufficient uniformity of the economic ore seams
Develop mill location at the mine site	• Additional surface disturbance • Development of new tailings disposal area • Difficulty in siting due to topography • Increased construction cost • New NRC license required • Complex permitting issues

Table 2.6 (Continued)

Alternative	Rejection Criteria
Use of slurry pipeline to transport ore to mill	• Potential pipeline ruptures • Slurry preparation prior to injection • Potentially insufficient water resource • Road construction required for pipeline monitoring • Continuous feed at mill could be interrupted • Excessive costs compared to truck transportation
Delay mine development until uranium prices increase	• Lack of BLM authority to restrict exploration operations • The No Action Alternative effectively analyzes the initial impacts associated from this alternative • Further NEPA analysis and WDEQ-LQD Interim Stabilization measures would be applied if the project is delayed beyond 5 years (see Section 2.1.4)

Table 2.7 Summary of Impact Analysis for the Proposed Action and Alternatives, and Potential Mitigation Measures, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
				AIR QUALITY			
Fugitive dust along access and haul roads	Potentially significant; LOP	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same Proposed Action and increased	No impact beyond existing levels	Implementation of dust control measures on access and haul roads; compliance with WDEQ-AQD permit guidelines
Fugitive dust emissions at the mine site and other emissions would increase but remain within state and federal standards	Moderate; LOP	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, and increased	No impact beyond existing levels	Application of water spray to construction, ore loading, and other disturbed areas; prompt revegetation of disturbed areas; regular maintenance of all internal combustion engines; controlled disposal of mine waste rock; adherence to EPA and WDEQ air quality guidelines
				TOPOGRAPHY/PHYSIOGRAPHY			
Alteration of surface drainages	Significant - location of mine waste rock pile in No Name drainage and permanent diversion of No Name Creek; moderate impacts to other drainages; LOP and beyond	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action, but reduced; potential beneficial impact from waste rock disposal at Big Eagle Mine (i.e., facilitating pit reclamation)	No impact beyond existing levels	Avoidance of significant features; use of appropriate construction and reclamation techniques
Cuts and fills at mine site and along roads	Negligible - no major landscape alterations; site-specific; LOP	Moderate - construction of new transportation corridor; LOP and until corridor is reclaimed	Same as Alternative A, but reduced	Same as Alternative A, but reduced	Same as Proposed Action	No impact beyond existing levels	Reestablishment and reclamation of drainages where possible; appropriate culvert design for road crossings; 404 permits as appropriate

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
				MINERALS/GAS AND OIL			
Development of uranium reserves	Significant/beneficial - near 100% depletion of recoverable reserves; permanent	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Significant adverse impact - uranium not obtained for beneficial use; violation of contractual agreements	None
Possible loss or recovery of valuable metals found in association with uranium deposits	Negligible (if potential reserves are not economically recoverable) to beneficial (if potential reserves are recovered); permanent	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact if potential reserves are not economically recoverable	Periodic testing of mined materials; application of appropriate recovery technologies
Localized temporary loss of development potential for oil and gas resources	Negligible to potentially significant - 15 to 25 year loss of access to potential resources beneath mine; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Communication and cooperation with lessees
Loss or recovery of gravel resources	Negligible to potentially beneficial (gravel could be used for development and maintenance of project-required roads); LOP	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action	No impact beyond existing levels	Communication and cooperation with potential users of gravel resource

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
				GEOLOGIC HAZARDS			
Earthquake damage to facilities	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action, but slightly reduced due to smaller sediment basin and dam at mine site	No impact	Use of best available technologies for structural support in declines and workings and for surface facilities
Land subsidence	Negligible; LOP and beyond	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Backfilling of portal area; use of best available technologies for decline and portal support
Landslides and slumping in the immediate vicinity of portals and roads	Negligible; site-specific; LOP	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action	No impact beyond existing levels	Avoidance of unstable sites along roads where possible; use of appropriate construction techniques in landslide areas; use of appropriate soil erosion control techniques/devices; prompt reclamation and revegetation
Increased sedimentation in floodplains due to construction activities	Negligible; LOP	Same as Proposed Action, but increased (one additional stream crossing)	Same as Alternative A	Same as Proposed Action	Same as Proposed Action, but reduced (smaller sediment basin and dam)	No impact beyond existing levels	Avoidance of floodplains and flood-prone areas where possible; use of appropriate construction techniques; use of appropriate soil erosion and sedimentation control techniques/devices; prompt revegetation
Disturbance of sand dune areas	Moderate; site-specific; LOP	Potentially significant - transportation corridor would cross 3.4 miles of stabilized sand dunes; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Avoidance of sand dune areas where possible; prompt stabilization and reclamation based on site-specific BLM reclamation criteria

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
				PALEONTOLOGICAL RESOURCES			
Disturbance/ destruction of significant fossil features during construction phase	Negligible; construction phase and LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Monitoring as necessary during construction phase; paleontological surveys and recovery programs conducted as deemed appropriate by BLM
Loss of important fossil materials due to private collection or vandalism of newly exposed areas	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Employee education
Discovery of previously unknown fossils	Potentially beneficial; construction phase	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Negligible to moderately adverse - new fossils would not be discovered	None
				SOILS			
Disturbance and erosional loss of soils during construction	Moderate - 229 acres of initial soil disturbance; 324 acres for LOP	Same as Proposed Action, but increased initially (305 acres initial soil disturbance) and reduced for LOP (280 acres LOP soil disturbance)	Same as Proposed Action, but increased initially (247 acres initial soil disturbance) and reduced for LOP (310 acres LOP soil disturbance)	Same as Proposed Action, but reduced (228 acres initial soil disturbance); 310 acres for LOP	Same as Proposed Action, but reduced (206 acres initial soil disturbance); LOP soil disturbance would be 388 acres due to use of existing disturbance at Big Eagle pit	No impact beyond existing levels	Avoidance of erosion-prone areas, where possible; use of appropriate erosion control techniques and devices; prompt reclamation and revegetation; no construction with frozen or saturated soils

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
				SOILS (Continued)			
Disturbance of sensitive soils (e.g., sand dunes)	Moderate; site-specific; LOP	Potentially significant - initially disturbance of 41 acres of sand dunes; 20 acres disturbed for the LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Avoidance of sensitive soils where possible; use of appropriate erosion control techniques and devices; prompt stabilization and reclamation based on site-specific BLM reclamation criteria
Soil compaction and loss of productivity	Moderate; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Use of appropriate reclamation techniques; restriction of off-road vehicle travel
Erosion due to augmented flows in Fourth Creek	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Monitoring of erosion transects; use of appropriate erosion control techniques/devices
Contamination due to accidental hazardous material spills	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Adherence to NPDES permit requirements; use of appropriate containment methodologies; implementation of immediate cleanup
				SURFACE WATER RESOURCES			
Increased turbidity, salinity, and sedimentation of surface waters due to runoff from disturbed areas	Moderate during construction phase; negligible during the LOP	Same as Proposed Action, but increased (one additional wetland/stream crossing and construction in stabilized sand dunes)	Same as Proposed Action, but increased (one additional wetland/stream crossing)	Same as Proposed Action	Same as Proposed Action, but slightly decreased due to disposal of mine waste rock at Big Eagle mine	No impact beyond existing levels	Avoidance of erosion-prone areas; construction during low-flow periods; use of appropriate erosion and sedimentation control techniques/devices; adherence to surface water monitoring plan

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
				SURFACE WATER RESOURCES (Continued)			
Contamination due to accidental hazardous material spills	Moderate during construction; negligible during LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Proper containment of hazardous materials in appropriately designed storage facilities; immediate notification of appropriate agencies regarding any spill or leakage; cleanup consistent with WDEQ and/or EPA guidelines; GMMV employees training; availability of containment and cleanup equipment
Contamination of surface waters due to mine water discharge	Negligible to moderate; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	NPDES permit guidelines; appropriate sediment basin design and construction; appropriate monitoring; water treatment if necessary
Potential acid generation	Negligible - low sulphur content and high neutralization potential of mine waste rock; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action, and reduced	No impact beyond existing levels	Acid generation potential monitoring; development and implementation of mitigation measures if necessary
				GROUNDWATER RESOURCES			
Contamination of groundwater aquifers due to accidental spills of hazardous materials and/or cross aquifer mixing through the declines and/or mine workings	Negligible - aquifers are isolated by relatively impermeable strata; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Appropriate groundwater monitoring; appropriate containment of potentially hazardous materials; immediate clean-up of accidental spills; implementation of WDEQ and/or EPA clean-up guidelines

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
			GROUNDWATER RESOURCES (Continued)				
Reduced water levels in aquifers due to mine dewatering	Negligible to moderate - no current domestic or agricultural users; presence of impermeable strata between aquifers; recharge from surface is anticipated; LOP and until aquifers are recharged	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Monitoring and mitigation measures designed to identify drawdown impacts
Reduced flow to springs and seeps (i.e., surface waters)	Negligible - springs and seeps fed by perched aquifers, (these aquifers are hydraulically separate from potentially affected aquifers)	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Monitoring of shallow wells to determine potential flow reductions to springs and seeps
			NOISE				
Increased noise levels within noise-sensitive locations (e.g., residences)	Negligible - no known noise-sensitive locations occur within 1 mile of the mine site; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Reduction of mine exhaust fan noise level with silencer diffuser or sound-absorbing materials; use of mufflers on vehicles and other internal combustion engines
Increased noise levels within crucial wildlife habitats (e.g., sage grouse leks) during critical periods	Moderate - along haul routes; LOP	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action	No impact beyond existing levels	Avoidance of construction activities immediately adjacent to crucial habitats during crucial periods; restriction of ore-hauling activities during sage grouse breeding season; use of mufflers on vehicles and other internal combustion engines

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
ODOR							
Presence of hazardous and/or noxious odors proximal to roads and facilities	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Use of emission controls
VEGETATION							
Removal of vegetation during construction	Negligible - 229 acres initial disturbance; 324 acres for LOP	Same as Proposed Action, but increased initially (305 acres initial disturbance) and reduced for LOP (280 acres LOP disturbance)	Same as Proposed Action, but increased initially (247 acres initial disturbance) and reduced for LOP (310 acres LOP disturbance)	Same as Proposed Action, but reduced (228 acres initial disturbance); 310 acres for LOP	Same as Proposed Action, but reduced (206 acres initial disturbance); LOP disturbance would be 388 acres due to use of existing disturbance at Big Eagle pit	No impact beyond existing levels	Minimization of disturbance areas; appropriate erosion and sedimentation control; appropriate prompt reclamation
Disturbance of vegetation on stabilized sand dunes	Negligible - only small areas disturbed during road upgrades; construction phase	Moderate - 41 acres initial disturbance; 20 acres for LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Avoidance of sand dunes, where possible; use of prompt site-specific stabilization and reclamation procedures
Changes in vegetation diversity following reclamation and potential weed infestation	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Use of weed control; revegetation with native/approved species; appropriate erosion control techniques in erosion-prone areas
Reclamation unsuccessful after 5 years	Negligible to moderate for LOP and beyond	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing levels	Further BLM and/or WDEQ approved reclamation efforts until successful reclamation is achieved

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
				WETLANDS AND RIPARIAN AREAS			
Disturbance of wetland/riparian areas	Negligible - 6.4 acres initially disturbed; beneficial - could occur if 20 acres of wetlands are developed or enhanced; LOP and beyond	Same as Proposed Action; but increased (6.7 acres initially disturbed)	Same as Alternative A	Same as Proposed Action	Same as Proposed Action and reduced (5.9 acres initially disturbed)	No impact beyond existing levels; no potential beneficial impacts from wetland/riparian enhancement	Avoidance of wetlands where possible; use of appropriate construction and erosion-control techniques; implementation of wetland/riparian area enhancement program
				WILDLIFE AND FISHERIES			
Big game displacement and/or stress	Negligible (habitat disturbance) to moderate (displacement due to human presence/activity); LOP	Same as Proposed Action and reduced	Same as Proposed Action and reduced	Same as Proposed Action and reduced	Same as Proposed Action, but slightly increased due to waste rock hauling activities	No impact beyond existing level	No road fencing; employee education; (e.g., do not stop vehicles unnecessarily); provision of escape ramps along roads during periods of snow
Big game mortality due to vehicle collisions and/or poaching	Negligible; LOP	Same as Proposed Action	Same as Alternative A	Same as Alternative A	Same as Proposed Action, but slightly increased due to waste rock hauling activities	No impact beyond existing level	Adherence to appropriate speed limits; provision of escape ramps along snowy roads; employee education and disciplinary action as appropriate; possible increased surveillance by WGFD
Loss of raptor nesting habitat	Negligible - initial disturbance of 56 acres in raptor nesting buffers; 57 acres for LOP disturbance	Same as Proposed Action, but increased, 82 acres initial disturbance in raptor nesting buffers; 51 acres for LOP	Same as Proposed Action, but reduced; 48 acres initial disturbance in raptor nesting buffers; 43 acres for LOP	Same as Alternative B	Same as Proposed Action - however, 128 acres of LOP disturbance due to Big Eagle facilities	No impact beyond existing level	Implementation of nesting surveys; consultation with BLM, USFWS, and WGFD regarding resolution of potential raptor nesting conflicts

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
WILDLIFE AND FISHERIES (Continued)							
Reduction in raptor prey species	Negligible - LOP	Same as Proposed Action, and reduced for LOP	Same as Alternative A	Same as Alternative A	Same as Proposed Action; but initial disturbance slightly reduced and LOP disturbance slightly increased	No impact beyond existing level	Appropriate reclamation of disturbed areas
Loss of sage grouse breeding/nesting habitat	Negligible - initial disturbance of 207 acres of probable nesting habitat and 3 acres of potential breeding habitat; LOP disturbance of 297 acres nesting habitat and 2 acres breeding habitat	Same as Proposed Action - however, disturbance in nesting habitat slightly increased initially and reduced for LOP and no disturbance to breeding habitat	Same as Proposed Action; however, disturbance in nesting habitat slightly increased initially and reduced for LOP	Same as Proposed Action, but slight increase in initial and LOP nesting habitat disturbance	Same as Proposed Action	No impact beyond existing level	Minimization project activities in these areas; appropriate reclamation with shrub species; restriction of ore-hauling activities during breeding season
Degradation of surface waters resulting in fish population reductions	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action, but slightly decreased	No impact beyond existing level	Appropriate construction and erosion-control techniques; proper design and construction of sediment dam
Overall wildlife habitat (i.e., small and nongame mammals, birds, amphibians, and reptiles) degradation	Negligible - 229 acres of initial disturbance; 324 acres for LOP	Same as Proposed Action, and increased (305 acres initial disturbance); 280 acres for LOP	Same as Proposed Action, and increased (247 acres initial disturbance); 310 acres for LOP	Same as Proposed Action, and reduced (228 acres initial disturbance); 310 acres for LOP	Same as Proposed Action, but only 206 acres of initial disturbance; however, LOP disturbance would be 388 acres due to use of Big Eagle pits	No impact beyond existing level	Avoidance of construction and/or operation activities within sensitive habitats; enforcement of appropriate speed limits; implementation of measures to restrict wildlife access to water detention ponds; use of appropriate monitoring and reclamation measures; appropriate power line design; appropriate containment of hazardous materials

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
				WILD HORSES			
Wild horse displacement or mortality due to habitat destruction or other activities of man	Negligible - 289 acres of initial disturbance; 418 acres for LOP	Same as Proposed Action, and reduced for LOP; slightly increased potential for vehicle collision mortality	Same as Proposed Action, and reduced for LOP; slightly increased potential for vehicle collision mortality	Same as Proposed Action, and reduced; slightly increased potential for vehicle collision mortality	Same as Proposed Action, but increased; slightly increased potential for vehicle collision mortality	No impact beyond existing level	Employee education; appropriate and timely revegetation; adherence to appropriate speed limits; wetland enhancement
				THREATENED AND ENDANGERED/CANDIDATE/STATE SENSITIVE SPECIES			
Mortality or disturbance of any listed or proposed T&E species or disturbance of critical habitat	Negligible - no known bald eagle or peregrine falcon nests or roosts, or black-footed ferret habitat; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Minimization of disturbance areas; consultation/coordination with BLM, USFWS, and WGFD; T&E conflicts; implementation of surveys as required; implementation of appropriate and timely reclamation and revegetation
Declining candidate species populations	Negligible - minor disturbance in preferred habitats; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Pre-construction surveys; consultation/coordination with BLM, USFWS, and WGFD; avoidance of habitats during critical periods
Reduction in state sensitive species due to mortality or habitat removal	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Pre-construction surveys; avoidance of habitats of potential occurrence where possible

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
			CULTURAL AND HISTORICAL RESOURCES				
Disturbance/ destruction of significant prehistoric sites and/or sites eligible for NRHP listing	Moderate and less than significant (most sites) to potentially significant (prehistoric Site 48FR479 and Rawlins-Fort Washakie Stage Road); LOP	Same as Proposed Action, but slightly increased	Same as Alternative A	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Implementation of cultural surveys, testing, and data recovery as required; programmatic agreement between BLM and SHPO; coordination with BLM, SHPO, and WDEQ concerning monitoring of sites; preparation of a mitigation plan
Loss of important cultural materials due to private collection or vandalism	Moderate and less than significant; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Employee education, and disciplinary action as appropriate
Disturbance of important Native American religious or culturally significant sites	Moderate and less than significant - no known sites occur in the area; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Cultural surveys and coordination with Native American groups and BLM
			SOCIOECONOMICS				
Increased job opportunities and economic growth in local communities	Beneficial - decreased unemployment and increased consumption of local goods and services for LOP; negligible impact post-LOP due to potential minor emigration of workers	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Moderately adverse - continued degradation/ stagnation of local communities	None
Increase in county, state, and federal tax revenues and royalties	Beneficial - increased monies available to private and public sectors; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Moderately adverse - no increase in available monies; LOP	None

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
				SOCIOECONOMICS (Continued)			
Increase in demand for temporary housing	Negligible to beneficial - numerous vacancies exist; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact to moderately adverse - vacancies would continue	None; adequate housing exists within local communities
Increase in demand for local government services	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	GMMV assistance to government agencies as needed; (e.g., sheriff/police, WGFD)
Disruption or change of character of communities	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Employment of as many local personnel as possible; coordination and cooperation among local employers
Increase in population	Negligible - adequate infrastructure exists in local communities; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	None
Decreased safety along project-required roads	Moderate; LOP	Negligible; LOP	Same as Proposed Action, but reduced	Same as Proposed Action, but reduced	Same as Proposed Action, but increased	No impact beyond existing level	Enforcement of speed limits; installation of safety signs; appropriate road design; increased maintenance of roads
				LAND USE			
Reduction of Animal Unit Months (AUMs) for livestock and wildlife	Negligible - 27 AUMs would be lost initially and 40 lost for the LOP	Same as Proposed Action, but LOP disturbance reduced to 38 AUMs	Same as Alternative A, but initial disturbance reduced to 27 AUMs	Same as Proposed Action, but initial disturbance increased to 29 AUMs	Same as Proposed Action, but LOP disturbance increased to 49 AUMs	No impact beyond existing level	Appropriate reclamation with palatable species
Potential increase in available water in Fourth Creek for livestock and wildlife	Beneficial; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Potentially adverse	Acquisition of NPDES permits and implementation of monitoring program; appropriate water treatment as necessary prior to discharge; wetland enhancement

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						Mitigation(s)
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	
			LAND USE (Continued)				
Changes in character and recreational uses of the area due to construction, presence of facilities, noise, dust, odor and increased human activities	Negligible - slight increase in recreational use of the area due to increase in local population and road improvements; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Application of water to construction areas and transportation routes; use mufflers on internal combustion engines; minimization of traffic during periods of elevated recreational use; avoidance of potentially important recreation sites; implementation of appropriate reclamation
Loss of mineral development opportunities	Potentially significant - 15 to 25-year loss of access to potential resources beneath the mine facilities; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Communication and cooperation with oil and gas lessees; periodic testing of ore and mine rock to determine whether valuable minerals occur; application of appropriate recovery technologies as necessary
			VISUAL RESOURCES				
Modification in the basic elements (form, line, color, or texture) of the visual resources by presence of facilities and equipment, or landscape modifications	Negligible - all disturbance is within VRM Class III, IV, and V areas; LOP	Moderate - all disturbance is within VRM Class III, IV and V areas, but new transportation corridor would occur in seldom-seen areas	Same as Alternative A	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Painting of structures with standard environmental colors to blend with surrounding topography; appropriate topographic shielding, reclamation, and revegetation

Table 2.7 (Continued)

Impact by Environmental Resource	Post-mitigation Impact Levels (Potential Unavoidable Adverse Impacts)						
	Proposed Action	Alternative A	Alternative B	Alternative C	Alternative D	No Action	Mitigation(s)
			HAZARDOUS MATERIALS				
Soil, surface water, and groundwater contamination and wildlife exposure	Negligible; LOP	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	Same as Proposed Action	No impact beyond existing level	Adherence to HMS and SPCCPs; use of appropriate measures to restrict wildlife access to hazardous materials; appropriate monitoring, containment, disposal, and clean-up of hazardous material

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, socioeconomic, land use, and visual resources for areas potentially impacted by the proposed Jackpot Mine Project. The resources that are addressed here were identified as issues during the scoping process and during interdisciplinary team (IDT) review of the project.

Critical elements of the human environment (BLM 1988a), their status in the project area, and their potential to be affected by the project are listed in Table 3.1. Four critical elements (areas of critical environmental concern, prime or unique farmlands, wild and scenic rivers, and wilderness) would not be affected by the project and are not further addressed. In addition to the critical elements, this EIS discusses topography/ physiography, mineral resources, geology and geologic hazards, paleontological resources, soils, noise, odor, biological resources including wild horses, socioeconomics, land use, and visual resources.

3.1 PHYSICAL RESOURCES

3.1.1 Climate and Air Quality

The regional climate is semiarid, continental, and is characterized by long, cold winters and short, cool summers (Trewartha and Horn 1980). Climatic data, available from stations at Jeffrey City, Muddy Gap, and Gas Hills (Martner 1986), were used to characterize the climate at the mine site and along project-required roads. Wind data collected at the Jackpot Mine site (GMMV 1994) were also included in the climate assessment.

Local annual precipitation averages 9-11 inches (Martner 1986). Higher elevations in the Green Mountain area may receive more precipitation (approximately 20 inches) (GMMV 1994). Most precipitation occurs during intense convectional (thunder) storms in April through July. Annual snowfall averages 54-64 inches. At the Muddy Gap and Gas Hills stations, snow has occurred in every month except July and August.

Thunderstorms occur approximately 30 days per year (Martner 1986). Hail occurs approximately four days per year. Tornadoes are infrequent, with only 10 recorded in Fremont County during the 32-year period between 1950 to 1982.

January is usually the coldest month of the year; the highest temperatures occur in July (Martner 1986). Average annual January temperatures range from a low of 12.6°F to a high of 30.1°F. July lows average 53.1°F and highs average 84.3°F. Temperatures may reach as low as -34.0°F or as high as 100.0°F. The growing season averages 60 to 80 days (mid-June to mid-August) at higher elevations and 180 days (mid-April to mid-October) at lower elevations.

Winds at the Jackpot Mine site are typically from the south/southwest and average 8.9 miles per hour (mph) (GMMV 1994). The maximum wind speed recorded at the site was 103.3 mph. Wind speeds are highest in April, July, and October.

Air quality at a specific location is described by concentrations of various pollutants in the atmosphere expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$) (Table 3.2). The significance of a pollutant concentration is usually determined by comparison with federal or state ambient air quality standards. These standards represent allowable levels of pollutants that protect public health and welfare with a reasonable margin of safety. National Ambient Air Quality Standards (NAAQS) are established by the EPA, and Wyoming ambient air quality standards are the same or slightly more stringent than the NAAQS (Table 3.2).

Air quality in the project area is generally very good, with low ambient concentrations of pollutants and background visibility at about 105 miles (BLM 1986a:97). The project area lies

Table 3.1 Critical Elements of the Human Environment for the GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Element[1]	Status on Project-required lands	Addressed in Text of EIS
Air quality	Potentially affected	Yes
Areas of critical environmental concern	None present	No
Cultural remains	Potentially affected	Yes
Farmlands (prime or unique)	None present	No
Floodplains	Potentially affected	Yes
Native American religious concerns	No effects anticipated	Yes
Threatened and endangered species	No effects anticipated	Yes
Wastes, hazardous or solid	Potentially affected	Yes
Water quality	Potentially affected	Yes
Wetlands/riparian zones	Potentially affected	Yes
Wild and scenic rivers	None present	No
Wilderness	None present	No

[1] As listed in BLM *NEPA Handbook H-1790-1* (BLM 1988a).

Table 3.2 National and Wyoming Ambient Air Quality Standards, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Pollutant	Averaging Time	National Standards[2] (NAAQS)	State of Wyoming Standards[2]
Carbon monoxide (CO)	1 hour	35 ppm (40,000 $\mu g/m^3$)	35 ppm (40,000 $\mu g/m^3$)
	8 hours	9 ppm (10,000 $\mu g/m^3$)	9 ppm (10,000 $\mu g/m^3$)
Ozone (O_3)	1 hour	0.12 ppm (235 $\mu g/m^3$)	None
Photochemical oxidants	1 hour	None	0.08 ppm (160 $\mu g/m^3$)
Nitrogen dioxide (NO_2)	1 year	0.05 ppm (100 $\mu g/m^3$)	0.05 ppm (100 $\mu g/m^3$)
Sulfur dioxide (SO_2)	3 hours	0.50 ppm (1,300 $\mu g/m^3$)	0.50 ppm (1,300 $\mu g/m^3$)
	24 hours	0.14 ppm (365 $\mu g/m^3$)	0.10 ppm (260 $\mu g/m^3$)
	1 year	0.03 ppm (80 $\mu g/m^3$)	0.02 ppm (60 $\mu g/m^3$)
Respirable particulate matter (PM_{10})	24 hours	150 $\mu g/m^3$	150 $\mu g/m^3$
	1 year	50 $\mu g/m^3$	50 $\mu g/m^3$
Total suspended particulate matter (TSP)	24 hours	None	150 $\mu g/m^3$
Lead (Pb)	3 months	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$

[1] Adapted from 40 CFR 50 and WDEQ (1989).

[2] $\mu g/m^3$ = micrograms per cubic meter;
ppm = parts per million;
Standards, other than ozone and those based on annual or quarterly averages, are not to be exceeded more than once a year. Standards based on annual or quarterly averages are not to be exceeded. The standard for ozone is not to be exceeded on more than an average of one day a year over a three-year period. All standards are primary (health) standards except the national 3-hour sulfur dioxide standard, which is a secondary (welfare) standard.

entirely within the Great Divide Air Basin (BLM 1987b:168). This basin is designated as a Prevention of Significant Deterioration (PSD) Class II area under the WDEQ-AQD Implementation Plan (BLM 1987b:154). PSD Class II areas are those that may be developed, and the release of limited concentrations of certain pollutants over ambient levels is permitted as long as NAAQS are maintained (WDEQ 1989).

The principal air quality pollutant in Wyoming is total suspended particulates (TSP) (BLM 1987b:157). Fugitive dust (uncontrolled, wind-carried particles) from natural sources and unpaved roads increases the ambient levels of TSP in the project area, especially during dry, windy periods. No violations of PSD Class II air quality standards for TSP are known for the project area (BLM 1986a:99, BLM 1987b:157).

Climatic factors such as prevailing winds, atmospheric stability, and mixing heights affect air quality by influencing the ability of air to disperse or dilute pollutants. Unstable conditions caused by vertical movement of air near the ground heated during the day and neutral air combined with relatively high wind speeds provide conditions conducive to dispersion and dilution of pollutants, thereby maintaining air quality (BLM 1987b:157). These conditions predominate throughout the project area; conditions are stable less than 30% of the time throughout the year.

3.1.2 Topography/Physiography

The project area lies within the Northern Great Plains physiographic province (Hunt 1967), which is typified by high elevation cold plains and mountains. The proposed WDEQ-LQD permit area is located on the southern flanks of Green Mountain, in Fremont County, south-central Wyoming (see Map 1.1). Green Mountain trends east-west and separates the Great Divide Basin to the south from the Granite Mountains to the north (Steele 1985).

Elevation in the portal area ranges from 7,745 to 7,940 feet above sea level, and the topography is rugged (see Map 1.2). To the north, the landscape is dominated by steep escarpments and mountainous terrain. Elevation at Round Park in the northern portion of the WDEQ-LQD mine permit area ranges from 8,860 to 9,055 feet. On the northern side of Round Park (the northern boundary of the WDEQ-LQD permit area) a steep slope to the north/northeast descends to elevations of approximately 8,200 feet.

Surface drainage on the southern side of Green Mountain is to the southwest into Crooks Creek (see Map 1.2). Crooks Creek flows west along the base of Green Mountain and then northwest through Crooks Gap, disappearing into the alluvium within 6 miles of the Sweetwater River, a tributary of the North Platte River. In the Round Park area, drainage is to the northeast into tributaries of Cottonwood Creek. Cottonwood Creek flows into the Sweetwater River.

The Jackpot Mine Access Road, Anaconda Road, and Big Eagle Haul Road gradually descend from the foothills at the proposed mine site to Crooks Gap. Alternative A and B transportation corridors descend in a southwesterly direction from the mine site and Big Eagle Haul Road, respectively, bypassing the Crooks Gap area (see Map 1.3). Elevations range from 7,940 feet (in the portal area) to 6,700 feet (at Crooks Gap). Drainage along existing and proposed roads is to the southwest into Crooks Creek.

Most of the Crooks Gap Wamsutter Road lies in the Great Divide Basin at elevations ranging from 6,700 to 7,220 feet (see Map 1.3). Drainage along the northern portion of the Crooks Gap Wamsutter Road is to Crooks Creek. However, the road crosses the continental divide such that south of the divide, drainage from the Crooks Gap Wamsutter Road and the Sweetwater Mill Access Road is into ephemeral stream channels that either disappear in the Great Divide Basin or flow into Lost Creek Lake, which has no outlet. Drainage from the Alternative A transportation corridor would be similar to that from the Crooks Gap Wamsutter Road, with drainage from northern portions of the corridor flowing into Crooks Creek and drainage from southern portions flowing into ephemeral drainages in the Great Divide Basin. Alternative C transportation corridor drainage would also flow to the same ephemeral drainages (see Map 1.3).

3.1.3 Geology

3.1.3.1 Geologic Overview

Most of the WDEQ-LQD permit area and existing and proposed access and haul roads are underlain by the Tertiary Battle Spring Formation (Map 3.1). A generalized geologic cross section of Green Mountain is provided in Figure 3.1. Quaternary alluvial deposits outcrop along Crooks Creek in the vicinity of Crooks Gap. There are also isolated patches of Quaternary sand dunes located along the Crooks Gap Wamsutter Road. The Alternative A transportation corridor would cross approximately 3 miles of dunes along its descent from the mine site.

The Battle Spring Formation is very similar to the Wasatch Formation, which lies to the south in the Great Divide Basin (Love and Christensen 1985), and is considered by some geologists to be part of the Wasatch Formation (personal communication, June 24, 1993, with Brent Breithaupt, Museum Curator, University of Wyoming Geology Museum). The Great Divide Basin contains more than 20,000 feet of sedimentary rocks. Tertiary sedimentary rocks are about 10,000 feet thick, and are underlain by several thousand feet of Mesozoic and Paleozoic rocks (Figure 3.1). The Battle Spring Formation is primarily composed of arkosic sedimentary rocks, primarily a mixture of interbedded conglomerates, sandstones, and siltstones (see Section 3.1.5.2) (GMMV 1994). Arkosic rocks consist of poorly sorted material (i.e., large rocks mixed with finer material), and contain abundant angular feldspar and quartz. These sediments were deposited as a series of southward-flowing, coalescing alluvial fans; these fans thin toward the south, and the grain size of these rocks also decreases southward. The mine site is on one of these alluvial fans developed in conjunction with what Groth (1970) and Childers (1974) call the Cottonwood Creek paleodrainage.

The Crooks Gap Conglomerate overlies the Battle Spring Formation and consists of coarse gravels and sandstones with zones containing large granite boulders. Rocks in the lower portion consist of massive and stratified conglomerates, sandstones, and siltstones.

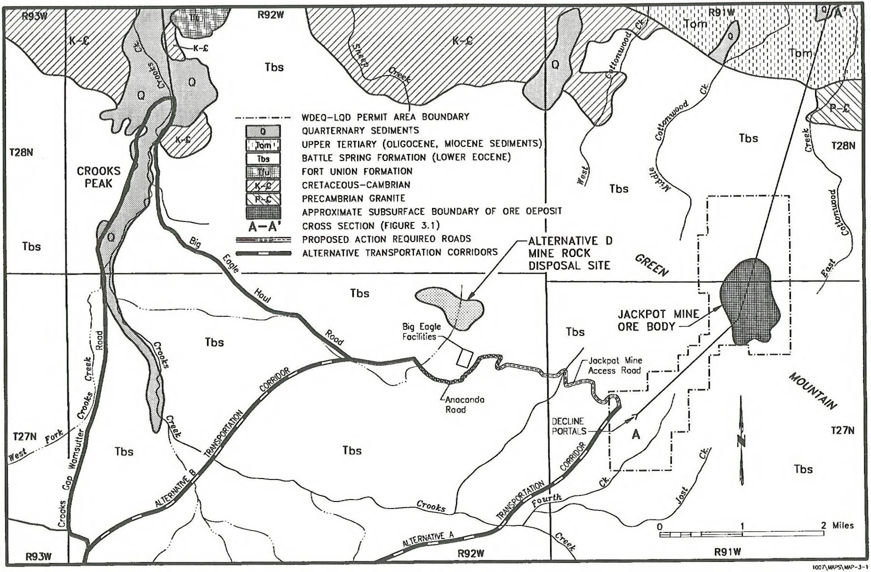
Although major faulting in the WDEQ-LQD permit area has not been identified, faulting is the principal reason that Green Mountain is in its present structural position. Case et al. (1986) discusses the Granite Mountain Fault on the north side of Green Mountain, and Blackstone (1991) and Wellborn and Wold (1993) discuss faulting on the south side of Green Mountain. Fault locations are shown on Map 3.2, and these faults may have some bearing on water movement in the vicinity of the project.

3.1.3.2 Mineral/Oil and Gas Resources

Uranium is the primary mineral resource underlying the proposed WDEQ-LQD permit area. It occurs as uraninite and coffinite in flat-lying layers of sandstone from depths of 2,500 to 3,500 feet below the ground surface under Round Park. It is estimated that more than 40,000 tons of U_3O_8 occur in an area occupying approximately one square mile beneath Round Park. By-product gold and other trace minerals also potentially occur in the area, but their potential for economic recovery is unknown.

Alluvial deposits along the Crooks Gap Wamsutter Road and alternative transportation corridors (see Map 3.1) are a potential source for sand and gravel (Harris and Meyer 1986). There are no known plans to mine these materials, and there are no other known mineral resources in the area (Harris et al. 1985).

There are no existing oil or gas wells within the proposed WDEQ-LQD Jackpot Mine permit area or within proposed haul and access road easement



Map 3.1 Surface Geology, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

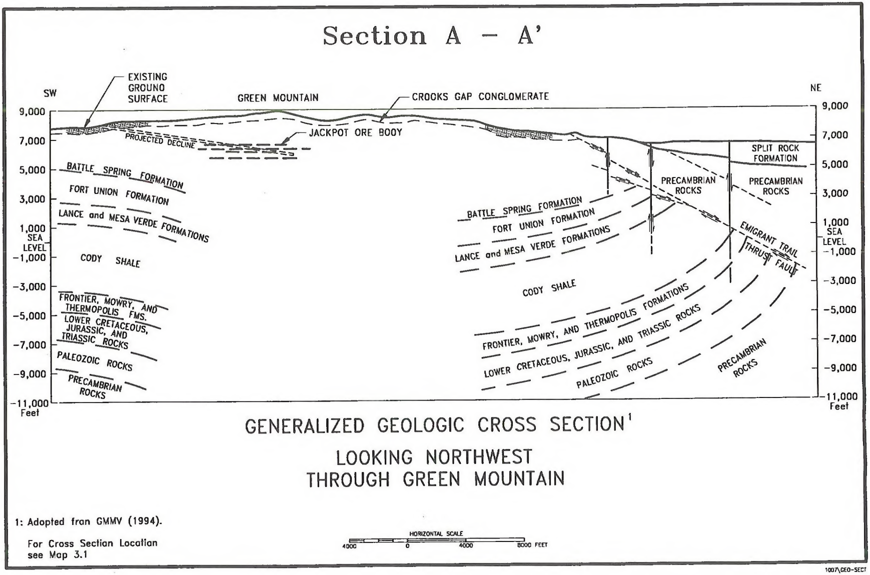
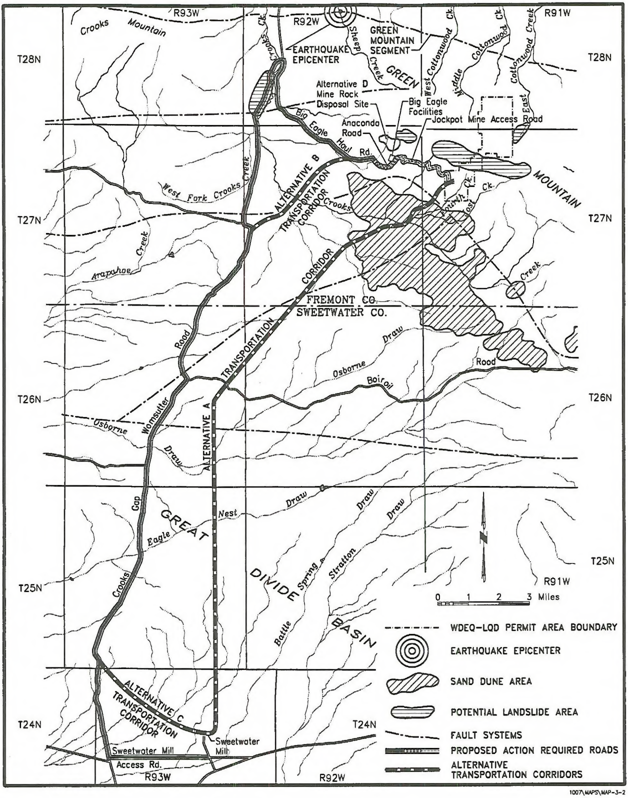


Figure 3.1 Generalized Geologic Cross Section, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.



Map 3.2 Geologic Hazards, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

areas. There are five undeveloped oil and gas leases in the Round Park area. None of these leases has been explored, and thus, the viability of the oil and gas resource is unknown. The existing Big Eagle Haul Road crosses potential Tertiary reservoir rocks (DeBruin and Boyd 1991), which also occur in the vicinity of the portals and declines. GMMV's uranium claim in the WDEQ-LQD permit area predates oil and gas leases in the same area, and thus, GMMV has priority for area development and mining.

The Green Mountain area may be underlain by aquifers containing thermal waters with temperatures in excess of 50°C (Hinckley et al. 1983). These aquifers would exist at depths greater than 4,500 feet below the ground surface, and a minimum of 1,000 feet below the proposed mine.

3.1.3.3 Geologic Hazards

The overall potential for seismic activity in the vicinity of the mine is low (Case et al. unpublished report). The South Granite Mountain fault system contains several active or suspected active faults located along the northern boundary of the Seminoe, Ferris, Green, and Crooks Mountains. Two segments of this fault system, near the Green and Ferris Mountains, show evidence of repeated late Quaternary displacement (Geomatrix Consultants, Inc. 1988). The last recorded earthquake in this region occurred in 1916 and had an epicenter in the central portion of T28N, R92W (Case et al. 1986) (Map 3.2). The earthquake had an intensity of III on the modified Mercalli scale. An intensity III earthquake can be felt indoors, but is often not recognized as an earthquake. The Green Mountain segment of the Granite Mountain fault system has the capability of generating a 6.75 magnitude (Richter Scale) earthquake with a recurrence interval of 2,000 to 6,000 years (personal communication, G.B. Glass, State Geologist, Geological Survey of Wyoming, January 1994; Case et al. 1986).

The Crooks Gap Wamsutter Road crosses four suspected active faults; however, no recent seismic activity has been recorded. Alternative transportation corridors would also cross these faults.

There are no known abandoned underground mines in the proposed mine area or along proposed access and haul roads.

The slope on the southern flank of Green Mountain within the proposed WDEQ-LQD permit area is classified as a potential landslide area (Larsen and Case 1991) (Map 3.2). The area, located approximately one mile north of the portal site, contains multiple rock slides and multiple flows (earth or debris-laden). Additional landslide areas, classified as multiple debris flows, are located along the Crooks Gap Wamsutter Road in Sections 30 and 31, T28N, R92W (Map 3.2).

A large southeast/northwest-trending area of sand dunes is located along the southern boundary of the WDEQ-LQD permit area (see Map 3.2). The Alternative A transportation corridor crosses this sand dune area. Other small, isolated sand dunes occur along the Crooks Gap Wamsutter Road and the Alternative A transportation corridor.

3.1.3.4 Paleontological Resources

The paleontology of the Battle Spring Formation has not been studied in detail. Some outcrops contain turtle-shell fragments, and several arkosic strata contain mollusks and notable amounts of calcite (Steele 1985, GMMV 1994), suggesting that there was significant marine invertebrate life at the time of deposition.

Because of the similarity between the Wasatch and the Battle Spring Formations, there is a potential for significant paleontologic resources to occur within the Battle Spring Formation in the mine area. Rocks in the Wasatch Formation contain abundant fossils, including mammals, reptiles, birds, mollusks, arthropods, and insects, as well as numerous other vertebrate and invertebrate species (Breithaupt 1990, Roehler et al. 1988, Simnacher 1970).

3.1.4 Soils

There are at least 20 soil types within the WDEQ-LQD permit area and along project-required roads and/or alternative transportation corridors (personal communication, June 1993, with Tom Gustafson, Soil Scientist, U.S. Soil Conservation Service [SCS]). These soils can be classified into four major groups based on topographic position: upland soils, fan apron and terrace soils, floodplain and toeslope soils, and sand dunes (Table 3.3). While detailed soils information is unavailable for soils along transportation corridors in Sweetwater County, soils in these areas are similar to those found along transportation corridors in southern Fremont County. Acreage estimates for soils along the corridors in Sweetwater County were calculated based on the percentage of each soil type crossed by roads in southern Fremont County.

Soils in upland areas typically have steep slopes (up to 45%) and occur on hillsides, ridges, and in mountainous areas (Table 3.3). Most of these soils formed in residuum and alluvium from sandstone, and are relatively shallow (less than 36 inches deep). Water and wind erosion potential is moderate. The principal limitations of these soils for use as sources of building materials or as topsoil are thinness, steep slopes, high clay content, large rock fragments, and aridity (Table 3.3). These soils occupy 47 acres at the Big Eagle facilities location and the proposed mine site and 200 acres along existing roads (i.e., areas within 50 feet of the center line of the roads) required for the Proposed Action. Upland soils along transportation corridors occupy approximately 163 acres under Alternative A, 14 acres under Alternative B, and 40 acres under Alternative C (see Map 1.3).

Soils on fan aprons and terraces tend to be deep and relatively well-developed, compared with upland soils (Table 3.3). Slopes range from 1 to 15%. These soils were formed in alluvium derived from mixed sources. The potential for water erosion is slight to moderate, and the wind erosion potential is moderate. Use is limited by slope, excess fines, stones, droughtiness, and erodibility. These soils occupy 66 acres at the Big Eagle facilities location and the proposed Jackpot Mine site and 242 acres along the existing roads required for the Proposed Action. Soils on fan aprons and terraces along alternative transportation corridors A, B, and C occupy approximately 159, 35, and 13 acres. respectively.

Soils on floodplains and toeslopes are flat (typically less than a 6% slope) and deep (greater than 60 inches) (Table 3.3). They were formed in alluvium from mixed sources. The water erosion potential of these soils is slight to moderate and the wind erosion potential is moderate. Use is limited by periodic flooding, excess clay, low strength, excess salts and sodium, droughtiness, and erodibility. These soils occupy 34 acres at the Big Eagle facilities location and the proposed Jackpot Mine site and 7 acres along the roads required for the Proposed Action and alternative transportation corridors.

One soil, the Zeomont loamy sand, occurs as sand dunes south of the WDEQ-LQD permit area (Table 3.3). This soil formed in aeolian (windblown) sands from mixed sources. Sand dune soils are relatively deep (greater than 60 inches) and have slopes of up to 35%. The water erosion potential is slight, but the wind erosion potential is severe. These soils are limited by erodibility, slope, excess sand, and droughtiness. No large areas with sand dune soils occur on areas required for the Proposed Action and Alternatives B, C, and D; however, approximately 41 acres of dunal soils occur along the Alternative A transportation corridor.

Project area soils range in productivity from 900 to 1,800 pounds per acre of native vegetation on lands in excellent condition in an average year (Table 3.3). They are used primarily for livestock grazing and wildlife habitat. None are being used for crop or hay production, and none are classified as prime farmland (GMMV 1994).

Soils at the proposed Jackpot Mine site and along the Jackpot Mine Access Road were mapped

Table 3.3 Selected Soils Information, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Soil Type	Slope (%)	Depth (inches)	Topographic Position	Parent Material	Erosion Hazard		Potential Vegetation	Excellent Condition Productivity (pounds/acre/year)	Limitations
					Water	Wind			
UPLAND									
Bluerim sandy loam	3-15	36	Hillslopes and ridges	Residuum and alluvium from sandstone	Moderate	Moderate	Needle-anrhd-thread, (*Stipa comata*), rhizomatous wheatgrasses (*Elymus* spp., Indian ricegrass (*Oryzopsis hymenoides*), silver sagebrush (*Artemisia cana*)	1,200	Depth to rock, slope, too clayey, droughty, soil blowing, excess fines
Onason gravelly sandy loam	3-30	17	Hill and ridge summits and shoulder slopes	Residuum and alluvium from sandstone	Moderate	Moderate	Bluebunch wheatgrass (*Elymus spicatus*), needle-and-thread, Indian ricegrass, big sagebrush	900	Depth to rock, slope, small stones, droughty, excess fines
Quander cobbly loam	25-45	>60	Mountain sideslopes	Alluvium from mixed sources	Moderate	n.d.[1]	Bluebunch wheatgrass, Idaho fescue (*Festuca idahoensis*), western wheatgrass, big sagebrush	1,300	Large stones, slope, area reclaim, excess fines, droughty
Youga loam	10-25	>60	Footslopes	Alluvium from mixed sources	Moderate	n.d.	Bluebunch wheatgrass, Griffith wheatgrass (*Elymus griffithsii*), Idaho fescue, prairie Junegrass (*Koeleria macrantha*), big sagebrush	1,500	Slope, small stones, excess fines
Onason sandy loam	10-45	11	Ridge summits and shoulder slopes	Residuum and alluvium from sandstone	Severe	Moderate	Bluebunch wheatgrass, needle-and-thread, Indian ricegrass, big sagebrush	900	Shallow, small stones, slope, excess fines, droughty, soil blowing
FAN APRONS AND TERRACES									
Cushool sandy loam	3-15	35	Hillslopes and fan aprons	Residuum and slope alluvium from sandstone	Moderate	Moderate	Needle-and-thread, rhizomatous wheatgrasses, Indian ricegrass, silver sagebrush	1,200	Depth to rock, slope, shrink-swell, too clayey, excess fines

Table 3.3 (Continued)

					Erosion Hazard				
Soil Type	Slope (%)	Depth (inches)	Topographic Position	Parent Material	Water	Wind	Potential Vegetation	Excellent Condition Productivity (pounds/acre/year)	Limitations
FAN APRONS AND TERRACES (Continued)									
Rock River sandy loam	1-8	>60	Terraces and fan aprons	Alluvium from mixed sources	Moderate	Moderate	Needle-and-thread, rhizomatous wheatgrasses, Indian ricegrass, silver sagebrush	1,200	Slope, too clayey, small stones, excess fines
Dahlquist very cobbly loam	2-12	>60	Fan aprons and piedmonts	Alluvium from mixed sources	Moderate	n.d.	Bluebunch wheatgrass, mutton bluegrass (*Poa fendleriana*), western wheatgrass, black sagebrush (*Artemisia nova*)	1,000	Large stones, slope, area reclaim, droughty
Peyton sandy loam	1-10	>60	Fan aprons and valley sideslopes	Noncalcareous alluvium from mixed sources	Slight	Moderate	Rhizomatous wheatgrasses, slender wheatgrass, needle grasses, big sagebrush	1,800	Cutbanks cave, slope, frost action, small stones, excess fines, soil blowing, erosive
Relsob sandy loam	1-6	>60	Fan aprons and toeslopes	Noncalcareous alluvium from sandstone	Slight	Moderate	Needle-and-thread, rhizomatous wheatgrasses, Indian ricegrass, silver sagebrush	1,200	Cutbanks cave, small stones, too sandy, area reclaim, droughty, soil blowing
Ryark sandy loam	1-6	>60	Fan aprons	Noncalcareous alluvium from sandstone	Slight	Moderate	Needle-and-thread, rhizomatous wheatgrasses, Indian ricegrass, silver sagebrush	1,200	Cutbanks cave, slope, small stones, droughty, soil blowing, too sandy
Ryark loamy sand	1-10	>60	Fan aprons	Noncalcareous alluvium from sandstone	Slight	Severe	Needle-and-thread, rhizomatous wheatgrasses, Indian ricegrass, silver sagebrush	1,200	Cutbanks cave, slope, small stones, droughty, too sandy, soil blowing

Table 3.3 (Continued)

Soil Type	Slope (%)	Depth (inches)	Topographic Position	Parent Material	Erosion Hazard		Potential Vegetation	Excellent Productivity Condition (pounds/acre/year)	Limitations
					Water	Wind			
FLOODPLAINS AND TOESLOPES									
Havre loam	0-30	>60	Floodplains and toeslopes	Alluvium from mixed sources	Slight	n.d.	Rhizomatous wheatgrasses, slender wheatgrass, needlegrass (*Stipa* spp.), big sagebrush	1,200	Flooding, low strength, frost action, too clayey, excess fines, erosive
Absher loam	1-6	>60	Floodplains and toeslopes	Alluvium from mixed sources	Moderate	n.d.	Alkali sacaton (*Sporobolus airoides*), basin wildrye (*Elymus cinereus*), rhizomatus wheatgrasses, greasewood		
Forelle loam	1-6	>60	Floodplains and toeslopes	Alluvium from mixed sources	Slight	n.d.	Western wheatgrass, needle-and-thread, bluebunch wheatgrass, big sagebrush	1,100	Shrink-swell, low strength, too clayey, small stones, excess fines, erosive
Glendive sandy loam	0-3	>60	Floodplains and toeslopes	Alluvium from mixed sources	Slight	Moderate	Rhizomatous wheatgrasses, slender wheatgrass, needle grasses, big sagebrush	1,800	Cutbanks cave, flooding, frost action, too sandy, too clayey, excess fines, erosive
DUNES									
Zeomont loamy sand	2-35	>60	Dunes	Aeolian sands from mixed sources	Slight	Severe	Needle-and-thread, Indian ricegrass, thickspike wheatgrass (*Elymus lanceolatus*), silver sagebrush	1,400	Cutbanks cave, slope, too sandy, droughty, soil blowing

[1] n.d. = no data.

during an Order 1 survey in 1987 (GMMV 1994). Results of soils laboratory analyses were used to identify sources of topsoil that would be suitable for use during reclamation. Three soil types--the Silas taxadjunct, the Bluerim taxadjunct, and the aquic cryoboroll--were identified as suitable using WDEQ-LQD suitability criteria (WDEQ-LQD 1984). These soils occupy 79 acres of the mine site and Jackpot Mine Access Road areas and would provide 143,777 cubic yards of topsoil for reclamation. The remainder of the soils at the proposed mine site and along the Jackpot Mine Access Road are unsuitable as topsoil, mainly due to the large volume (greater than 25%) of coarse fragments they contain (GMMV 1994).

3.1.5 Water Resources

3.1.5.1 Surface Water

This section provides a description of the surface water regime in the area of the proposed Jackpot Mine and the surrounding Green Mountain. Further detail on the individual streams and tributaries of the area can be found in GMMV (1994).

For the purposes of this EIS, the surface water is divided into five watersheds. Two watersheds, East Cottonwood Creek and Middle Cottonwood Creek, are on the northern side of Green Mountain (see Map 1.3). Three watersheds, Jost Creek, Fourth Creek, and Crooks Creek, are located on the southern side of Green Mountain.

General Description. East Cottonwood Creek and the East and West Forks of Middle Cottonwood Creek drain the northern side of Green Mountain in the immediate vicinity of the WDEQ-LQD permit area boundary (see Map 1.3). These streams are perennial in their lower reaches and ephemeral or intermittent in their upper reaches. Only the upper reaches of the streams are within the WDEQ-LQD proposed permit boundary. These streams flow to the north and northeast and are tributaries to the Sweetwater River, a major east-flowing perennial tributary of the North Platte River. The Cottonwood Creek watersheds would receive no surface water discharge or runoff from the mining operations, and groundwater inflows to active underground mining areas beneath these creeks are not expected to affect flow rates (GMMV 1994).

The streams which drain the southern side of Green Mountain in the immediate vicinity of the WDEQ-LQD permit boundary are Jost Creek, Fourth Creek, East and West Sand Spring Draws, and No Name Creek (see Maps 1.2 and 1.3). These streams flow to the south/southwest and are tributaries to Crooks Creek. Crooks Creek, a tributary of the Sweetwater River, flows northwest along the base of Green Mountain toward Crooks Gap and Jeffrey City. No Name Creek, an ephemeral drainage flowing only in direct response to precipitation, is a tributary to Fourth Creek. Fourth Creek, an intermittent stream in its upper reaches, is a tributary to Jost Creek. Jost Creek, above the confluence with Fourth Creek is an intermittent stream; below the confluence with Fourth Creek it is perennial. East and West Sand Spring Draws are ephemeral in their upper reaches and perennial in their lower reaches. These watersheds would receive surface water discharges from the proposed Jackpot Mine operations.

Hydrology. The SCS (1972) triangular hydrograph method was used in the hydrologic analysis for this project to estimate stream flood flow quantities. This method incorporates site-specific input from existing topographic maps of the area, and published hydrologic, vegetation, and soil data. The peak discharges for the drainage basins were computed for return periods of 2, 10, 25, 50, and 100 years and for durations of 1, 6, and 24 hours (GMMV 1994). These peak flows were determined for each major stream and several sub-watersheds. A comparison of the peak 24-hour, 2- and 100-year flow rates within the drainage basins is provided in Table 3.4.

Surface Water Flow Monitoring. Three surface water flow-monitoring programs have been conducted in the project area. The purpose of these programs was to characterize existing surface water flow conditions and provide a minimum of

Table 3.4 Summary of Peak Discharge Rates for Creeks in the Vicinity of the GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

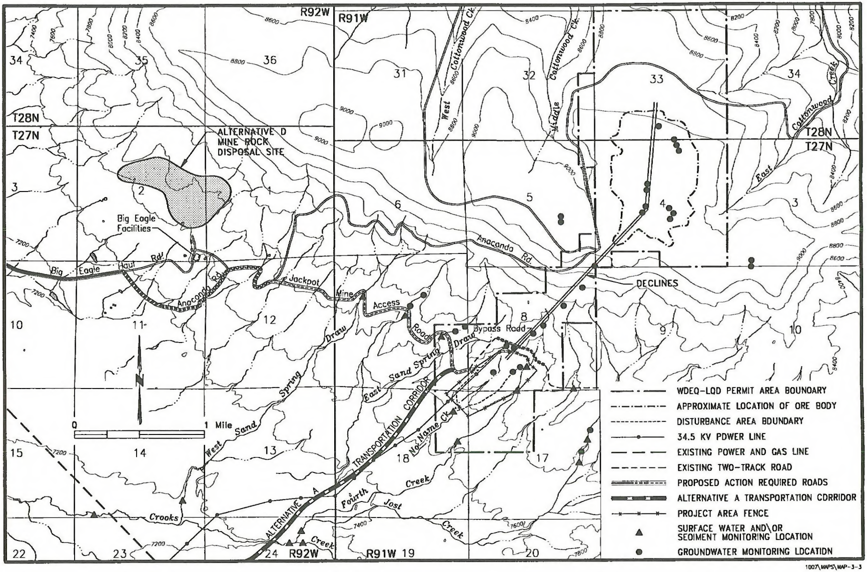
Drainage Basin (Size)	24-hour Recurrence Interval	Peak Runoff Rate cfs[2]	Peak Runoff Rate gpm[3]
East Cottonwood Creek (5.27 square miles)	2-year 100-year	17.0 418.0	7,630.6 187,623.5
East Fork Middle Cottonwood Creek (1.86 square miles)	2-year 100-year	3.5 125.1	210.0 56,152.4
Jost Creek (4.10 square miles)	2-year 100-year	42.3 520.4	18,986.8 233,586.7
No Name Creek (0.35 square mile)	2-year 100-year	5.1 74.2	2,289.2 33,305.4
Fourth Creek (4.12 square mile)	2-year 100-year	8.6 121.8	3,860.2 54,671.2

[1] Adapted from GMMV (1994).
[2] cfs = cubic feet per second.
[3] gpm = gallons per minute.

one year of site-specific flow data for streams on Green Mountain. The flow-monitoring programs also attempted to supplement and verify theoretical peak flows. The number and type of surface water monitoring stations were selected so that the data collected would characterize surface flow regimes for each drainage. Each of the monitoring programs consisted of periodic measurement at frequencies sufficient to describe stream flows.

The most recent flow-monitoring program was conducted at 18 monitoring stations; station locations on and within the immediate vicinity of the WDEQ-LQD permit area are shown on Map 3.3. Based on the data obtained from the flow-monitoring program, the upper reaches of Jost Creek, Sand Spring Draw, No Name Creek, and Fourth Creek drainages are probably ephemeral. The monitoring results indicated either no flow or isolated flow readings. Monitoring stations on lower Sand Spring Draw, Jost Creek, Fourth Creek, both Cottonwood drainages, and Crooks Creek, all indicated perennial flows (GMMV 1994).

Compared with the theoretical peak flow estimates for the various flood flow recurrence intervals discussed above, the measurements recorded over the duration of the stream flow monitoring period reflect mainly low flow discharges. The highest flow recorded was over 13.1 cubic feet per second in East Cottonwood Creek during June 1991. Flow in the streams varied depending on the season. The highest flows were typically in the spring in response to snowmelt, while low flows typically occurred in the fall. The perennial streams had an average flow of approximately 1.3 cubic feet per second. Most flows for the intermittent drainages were less than 1.0 cubic feet per second.



Map 3.3 Water Monitoring Stations, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

On the northern slope of Green Mountain, flows in Middle Cottonwood Creek ranged from a high of 6.4 cubic feet per second in June 1991 to a low of less than 0.1 cubic feet per second in January 1991. Discharges for East Cottonwood Creek ranged from a high of 13.1 cubic feet per second in June 1991 to a low of less than 0.1 cubic feet per second in August 1992. Peak flows in the Cottonwood Creek drainages correspond approximately to the five to 15-year flood levels (GMMV 1994).

Comparisons between theoretical and measured discharges, and peak flows and stage discharge relationships for Jost Creek and Fourth Creek drainages are presented in GMMV (1994). Drainage flows were measured during low flow conditions, with most of the stations reporting flows of less than 1.0 cubic feet per second for most of the sampling period.

Sediment and Erosion. To estimate the actual sediment load of streams in the mine area, a suspended sediment monitoring station was established on Fourth Creek at the southern extreme of the mine permit boundary (Map 3.3). Three periods of flow were recorded: July 1991, September 1991, and May 1992. Flow events during the periods were under low flow conditions. Due to the limited range of flows, no estimate of suspended sediment load for significant flood events could be obtained.

To determine the erosion condition of the streams in the area, measurements were conducted at two stream transects to document baseline stream erosion conditions. Measurements indicated no erosion occurred during the monitoring period.

Surface Water Chemistry. Surface water sampling programs in the vicinity of the WDEQ-LQD permit area have been conducted by Utah International, Anaconda, and USE (GMMV 1994). Sixteen monitoring sites were sampled between 1975 and 1986. Between 1987 and 1992, water-quality sampling was conducted by USE and its consultants at four of the sites sampled from 1975 to 1986, as well as fourteen sites newly established for the ongoing surface water-quality monitoring program. The monitoring results for the two monitoring periods were combined into one database and summaries were prepared. Twenty-eight monitoring stations (see Map 3.3), were included in the summaries to characterize the surface water of the WDEQ-LQD permit area and adjacent waters. These monitoring sites are located on the following watersheds:

- East Cottonwood Creek (Table 3.5),
- Middle Cottonwood Creek (Table 3.6),
- Fourth Creek (Table 3.7),
- Jost Creek (Table 3.8), and
- Crooks Creek (Table 3.9).

Results from the 1975 - 1986 and the 1987 - 1992 surface water monitoring programs are presented in the *Jackpot Mine Permit Application*, Attachments D6-5 and D6-6, respectively (GMMV 1994). The range of values encountered for key water-quality variables in Green Mountain surface waters during the two periods are summarized in Tables 3.5 through 3.9 for selected area watersheds. Surface water quality analysis from Green Mountain watersheds indicates that water quality is generally within WDEQ guidelines for Class A, Fish/Aquatic Life Concentrations (WDEQ 1980) (see Section 3.1.5.2). Quality parameters that exceed WDEQ Class A quality standards are noted in Tables 3.5 through 3.9.

With few exceptions, Green Mountain surface waters are predominantly calcium bicarbonate waters, with carbonate hardness exceeding 50% (GMMV 1994). The data indicate that base flow discharge from the groundwater system to the streams is the same water type as the deeper groundwater. Characteristics of the groundwater regime (see Section 3.1.5.2) and the above data suggest that the major streams along the base of Green Mountain represent discharge areas for the Battle Spring Formation. The minor ephemeral drainages that flow across the Crooks Gap Conglomerate within the Jost Creek and Sand Spring basins have low concentrations of TDS with disproportionately high concentrations of sulfate, chloride, and magnesium. The higher concentrations of these ions are likely due to lower flow rates within these drainages (GMMV 1994).

Table 3.5 East Cottonwood Creek Surface Water Quality, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Quality Parameter	Units[2]	No. of Analyses	Range
MAJOR CATIONS/ANIONS AND OTHER CONSTITUENTS			
Calcium	mg/l	12	3.8 - 808.0
Magnesium	mg/l	12	1.2 - 5.0
Potassium	mg/l	12	0.4 - 1.8
Sodium	mg/l	12	<1.0 - 12.0
Hardness as calcium carbonate ($CaCO_3$)	mg/l	4	24.0 - 68.0
Alkalinity as $CaCO_3$	mg/l	6	12.0 - 77.0
Sulfate	mg/l	11	1.0 - 12.0
Chloride	mg/l	12	<0.1 - 12.0
Fluoride	mg/l	12	<0.1 - 0.23
Bicarbonate	mg/l HCO_3	12	20.0 - 93.0
Major cations	meq/l	12	0.43 - 1.76
Major anions	meq/l	12	0.56 - 1.86
PHYSICAL CONSTITUENTS			
pH (lab)	s.u.	8	7.3 - 8.2
pH (field)	s.u.	10	6.4 - 8.7
Conductivity (lab)	umhos/cm	8	50 - 207
Conductivity (field)	umhos/cm	3	70 - 96
TDS	mg/l	12	50.0 - 104.0
TSS	mg/l	10	<1.0 - 160.0
Temperature (field)	°C	11	0.0 - 20.9
NUTRIENT SPECIES			
Ammonia	mg/l	12	<0.05 - 0.05[3]
Nitrate	mg/l	9	<0.01 - 0.28
Nitrite	mg/l	11	<0.001 - 0.15

Table 3.5 (Continued)

Quality Parameter	Units[2]	No. of Analyses	Range
TRACE METALS (DISSOLVED)			
Aluminum	mg/l	12	<0.10 - 0.30[3]
Arsenic	mg/l	12	<0.002 - 0.008
Barium	mg/l	12	<0.10 - 0.10
Boron	mg/l	12	<0.10 - 0.18
Cadmium	mg/l	12	<0.001 - 0.002
Chromium	mg/l	11	<0.01 - 0.05
Copper	mg/l	12	<0.01 - 0.01
Iron	mg/l	12	<0.05 - 0.31
Lead	mg/l	12	<0.005 - 0.005
Manganese	mg/l	12	<0.01 - 0.07
Mercury	mg/l	12	<0.0001 - 0.0002[3]
Molybdenum	mg/l	12	<0.005 - 0.10
Nickel	mg/l	12	<0.01 - 0.05
Selenium	mg/l	12	<0.001 - 0.002
Vanadium	mg/l	10	<0.005 - 0.10
Zinc	mg/l	12	<0.005 - 0.02
RADIONUCLIDES			
Uranium	ppb	12	<0.02 - 5.00
Radium 226	pCi/l	12	<0.20 - 1.0

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[1] Adapted from GMMV (1994); water quality values from Sites EC-2, Trib.(S)EC, Trib.(N)E, and Trib.(S)E.

[2] mg/l = milligrams per liter
mg/l HCO_3 = milligrams of bicarbonate per liter
mg/l CO_3 = milligrams of carbonate per liter
meq/l = milliequivalents per liter
s.u. = standard units
umhos/cm = microohms^{-1} per centimeter
°C = degrees Celsius
ppb = parts per billion
pCi/l = picocuries per liter

[3] Range exceeds WDEQ Class A, Fish/Aquatic Life Concentration Standard (WDEQ 1980); (see Section 3.1.5.2, Table 3.11).

Table 3.6 Middle Cottonwood Creek Surface Water Quality, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Quality Parameter	Units[2]	No. of Analyses	Range
MAJOR CATIONS/ANIONS AND OTHER CONSTITUENTS			
Calcium	mg/l	16	5.3 - 27.0
Magnesium	mg/l	16	0.32 - 5.00
Potassium	mg/l	16	<1.0 - 5.4
Sodium	mg/l	16	<1.0 - 9.1
Hardness as $CaCO_3$	mg/l	5	52.0 - 74.0
Alkalinity as $CaCO_3$	mg/l	8	33.0 - 78.0
Sulfate	mg/l	15	0.5 - 25.0
Chloride	mg/l	16	<3.0 - 16.0
Fluoride	mg/l	16	<0.10 - 0.24
Bicarbonate	mg/l HCO_3	16	20.0 - 101.0
Carbonate	mg/l CO_3	16	0.0 - <1.0
Major cations	meq/l	14	0.36 - 1.89
Major anions	meq/l	14	0.52 - 1.98
PHYSICAL CONSTITUENTS			
pH (lab)	s.u.	14	6.6 - 8.1
pH (field)	s.u.	9	6.8 - 8.8
Conductivity (lab)	umhos/cm	14	47 - 165
Conductivity (field)	umhos/cm	4	50 - 149
TDS	mg/l	16	43.1 - 148.0
TSS	mg/l	12	<1.0 - 1,913.0
Temperature (field)	°C	14	0.4 - 20.0
NUTRIENT SPECIES			
Ammonia	mg/l	16	<0.05 - 0.10[3]
Nitrate	mg/l	13	<0.01 - 1.80
Nitrite	mg/l	11	<0.001 - 0.280

Table 3.6 (Continued)

Quality Parameter	Units[2]	No. of Analyses	Range
TRACE METALS (DISSOLVED)			
Aluminum	mg/l	16	<0.100 - 0.243[3]
Arsenic	mg/l	16	<0.001 - 0.021
Barium	mg/l	16	<0.03 - 0.10
Boron	mg/l	16	<0.005 - 0.350
Cadmium	mg/l	16	<0.001 - 0.100
Chromium	mg/l	16	<0.01 - 0.05
Copper	mg/l	16	<0.01 - 0.01
Iron	mg/l	16	<0.05 - 0.65[3]
Lead	mg/l	16	<0.005 - 0.005
Manganese	mg/l	16	<0.01 - 0.03
Mercury	mg/l	16	<0.0001 - 0.0002[3]
Molybdenum	mg/l	16	<0.005 - 0.100
Nickel	mg/l	16	<0.01 - 0.05
Selenium	mg/l	16	<0.001 - 0.002
Vanadium	mg/l	13	<0.005 - 0.100
Zinc	mg/l	16	<0.005 - 0.017
RADIONUCLIDES			
Uranium	ppb	16	<0.3 - 32.0[3]
Radium 226	pCi/l	16	<0.2 - 1.7

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[1] Adapted from GMMV (1994); water quality values from Sites EFMC, WC-2, WFMC(N), and WFMC(S).

[2] mg/l = milligrams per liter
mg/l HCO_3 = milligrams of bicarbonate per liter
mg/l CO_3 = milligrams of carbonate per liter
meq/l = milliequivalents per liter
s.u. = standard units
umhos/cm = microohms^{-1} per centimeter
°C = degrees Celsius
ppb = parts per billion
pCi/l = picocuries per liter

[3] Range exceeds WDEQ Class A, Fish/Aquatic Life Concentration Standard (WDEQ 1980); (see Section 3.1.5.2, Table 3.11).

Table 3.7 Fourth Creek Surface Water Quality, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Quality Parameter	Units[2]	No. of Analyses	Range
MAJOR CATIONS/ANIONS AND OTHER CONSTITUENTS			
Calcium	mg/l	21	6.40 - 26.0
Magnesium	mg/l	21	0.28 - 8.00
Potassium	mg/l	21	<1.0 - 5.17
Sodium	mg/l	21	3.0 - 13.0
Hardness as $CaCO_3$	mg/l	5	44.0 - 82.0
Alkalinity as $CaCO_3$	mg/l	7	56.0 - 92.0
Sulfate	mg/l	21	<0.1 - 10.0
Chloride	mg/l	21	<0.1 - 24.0
Fluoride	mg/l	20	<0.01 - 0.43
Carbonate	mg/l CO_3	21	0.0 - <1.0
Bicarbonate	mg/l HCO_3	21	50.4 - 91.5
Major cations	meq/l	16	1.00 - 2.03
Major anions	meq/l	16	0.93 - 2.05
PHYSICAL CONSTITUENTS			
pH (lab)	s.u.	18	6.6 - 8.0
pH (field)	s.u.	10	7.2 - 8.6
Conductivity (lab)	umhos/cm	19	96 - 220
TDS	mg/l	20	65.0 - 120.0
TSS	mg/l	9	<1.0 - 35.0
Temperature (field)	°C	11	1.7 - 38.0
NUTRIENT SPECIES			
Ammonia	mg/l	21	<0.05 - 0.91[3]
Nitrate	mg/l	15	<0.01 - 7.40
Nitrite	mg/l	15	<0.001 - 0.170

Table 3.7 (Continued)

Quality Parameter	Units[2]	No. of Analyses	Range
TRACE METALS (DISSOLVED)			
Aluminum	mg/l	21	<0.10 - 0.31[3]
Arsenic	mg/l	21	<0.001 - 0.003
Barium	mg/l	21	<0.03 - 0.10
Boron	mg/l	21	<0.01 - 0.20
Cadmium	mg/l	21	<0.001 - 0.03
Chromium	mg/l	21	<0.01 - 0.05
Copper	mg/l	21	<0.01 - 0.01
Iron	mg/l	21	<0.01 - 10.30[3]
Lead	mg/l	21	<0.005 - 0.180[3]
Manganese	mg/l	21	<0.01 - 0.14
Mercury	mg/l	21	<0.00004 - 0.0002[3]
Molybdenum	mg/l	21	<0.005 - 0.100
Nickel	mg/l	21	<0.02 - 0.11
Selenium	mg/l	21	<0.001 - 0.003
Vanadium	mg/l	19	<0.1 - 0.4
Zinc	mg/l	21	<0.005 - 0.030
RADIONUCLIDES			
Uranium	ppb	21	<0.01 - 5.0
Radium 226	pCi/l	21	<0.20 - 8.14[3]

[1] Adapted from GMMV (1994); water quality values from Sites F-2, FC-1, and X-7.

[2] mg/l = milligrams per liter
mg/l HCO_3 = milligrams of bicarbonate per liter
mg/l CO_3 = milligrams of carbonate per liter
meq/l = milliequivalents per liter
s.u. = standard units
umhos/cm = microohms^{-1} per centimeter
°C = degrees Celsius
ppb = parts per billion
pCi/l = picocuries per liter

[3] Range exceeds WDEQ Class A, Fish/Aquatic Life Concentration Standard (WDEQ 1980); (see Section 3.1.5.2, Table 3.11).

Table 3.8 Jost Creek Surface Water Quality, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Quality Parameter	Units[2]	No. of Analyses	Range
MAJOR CATIONS/ANIONS AND OTHER CONSTITUENTS			
Calcium	mg/l	8	6.5 - 23.6
Magnesium	mg/l	8	1.4 - 2.8
Potassium	mg/l	8	<1.00 - 2.12
Sodium	mg/l	8	<1.0 - 6.7
Sulfate	mg/l	8	<1.0 - 26.0
Chloride	mg/l	8	<0.1 - 2.9
Fluoride	mg/l	8	<0.10 - 0.17
Bicarbonate	mg/l HCO_3	8	26.8 - 80.0
Major cations	meq/l	8	0.47 - 1.62
Major anions	meq/l	8	0.52 - 1.68
PHYSICAL CONSTITUENTS			
pH (lab)	s.u.	7	6.8 - 8.0
pH (field)	s.u.	8	6.5 - 8.0
Conductivity (lab)	umhos/cm	4	95 - 155
TDS	mg/l	8	51.7 - 122.0
TSS	mg/l	8	<1.0 - 9.2
Temperature (field)	°C	8	5.3 - 19.8
NUTRIENT SPECIES			
Ammonia	mg/l	8	<0.05 - 0.05[3]
Nitrate	mg/l	6	<0.01 - 0.26
Nitrite	mg/l	7	<0.01 - 0.02

Table 3.8 (Continued)

Quality Parameter	Units[2]	No. of Analyses	Range
TRACE METALS (DISSOLVED)			
Aluminum	mg/l	8	<0.10 - 0.15[3]
Arsenic	mg/l	8	0.0001 - 0.002
Barium	mg/l	8	<0.1 - 0.1
Boron	mg/l	8	<0.1 - 0.1
Cadmium	mg/l	8	<0.001 - 0.005
Chromium	mg/l	8	<0.05 - 0.05
Copper	mg/l	8	<0.01 - 0.01
Iron	mg/l	8	<0.05 - 0.13
Lead	mg/l	8	<0.005 - 0.005
Manganese	mg/l	8	<0.01 - 0.01
Molybdenum	mg/l	8	<0.0002 - 0.0002
Mercury	mg/l	8	<0.1 - 0.1[3]
Nickel	mg/l	8	<0.05 - 0.05
Selenium	mg/l	8	<0.001 - 0.002
Vanadium	mg/l	8	<0.1 - 0.1
Zinc	mg/l	8	<0.01 - 0.01
RADIONUCLIDES			
Uranium	ppb	8	<0.3 - 6.0
Radium 226	pCi/l	8	<0.2 - 1.2

[1] Adapted from GMMV (1994); water quality values from Sites F-9, X-5, and X-6.

[2] mg/l = milligrams per liter
mg/l HCO_3 = milligrams of bicarbonate per liter
mg/l CO_3 = milligrams of carbonate per liter
meq/l = milliequivalents per liter
s.u. = standard units
umhos/cm = microohms^{-1} per centimeter
°C = degrees Celsius
ppb = parts per billion
pCi/l = picocuries per liter

[3] Range exceeds WDEQ Class A, Fish/Aquatic Life Concentration Standard (WDEQ 1980); (see Section 3.1.5.2, Table 3.11).

Table 3.9 Crooks Creek Surface Water Quality, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Quality Parameter	Units[2]	No. of Analyses	Range
MAJOR CATIONS/ANIONS AND OTHER CONSTITUENTS			
Calcium	mg/l	60	13.6 - 44.0
Magnesium	mg/l	60	0.49 - 8.70
Potassium	mg/l	60	1.0 - 16.0
Sodium	mg/l	60	3.0 - 29.0
Hardness as $CaCO_3$	mg/l	23	64.0 - 143.0
Alkalinity as $CaCO_3$	mg/l	29	63.0 - 135.0
Sulfate	mg/l	60	<5.0 - 36.0
Chloride	mg/l	60	<0.10 - 24.0
Fluoride	mg/l	60	<0.01 - 0.51
Carbonate	mg/l CO_3	60	0.0 - 71.0
Bicarbonate	mg/l HCO_3	60	0.0 - 164.0
Major cations	meq/l	43	1.39 - 3.30
Major anions	meq/l	43	1.49 - 3.17
PHYSICAL CONSTITUENTS			
pH (lab)	s.u.	55	6.64 - 8.26
pH (field)	s.u.	24	7.4 - 9.1[3]
Conductivity (lab)	umhos/cm	47	143 - 5,900
Conductivity (field)	umhos/cm	6	100 - 175
TDS	mg/l	59	62.0 - 189.0
TSS	mg/l	24	< 1.0 - 206.0
Temperature (field)	°C	34	0.0 - 24.6
NUTRIENT SPECIES			
Ammonia	mg/l	55	<0.02 - 0.98[3]
Nitrate	mg/l	53	<0.01 - 5.52
Nitrite	mg/l	45	<0.001 - 5.52

Table 3.9 (Continued)

Quality Parameter	Units[2]	No. of Analyses	Range
TRACE METALS (DISSOLVED)			
Aluminum	mg/l	51	<0.01 - 1.30[3]
Arsenic	mg/l	60	<0.001 - 0.010
Barium	mg/l	50	<0.03 - 0.58
Boron	mg/l	60	<0.01 - 2.20
Cadmium	mg/l	60	<0.001 - 0.030[3]
Chromium	mg/l	52	<0.001 - 0.050
Copper	mg/l	52	<0.01 - 0.02
Iron	mg/l	60	<0.01 - 9.20[3]
Lead	mg/l	60	<0.005 - 0.20[3]
Manganese	mg/l	51	<0.01 - 0.10
Mercury	mg/l	51	<0.00004 - 0.06000[3]
Molybdenum	mg/l	59	<0.001 - 0.100
Nickel	mg/l	51	<0.002 - 0.090
Selenium	mg/l	60	<0.001 - 0.006
Vanadium	mg/l	51	<0.005 - 0.400
Zinc	mg/l	60	<0.005 - 0.040
RADIONUCLIDES			
Uranium	ppb	58	<1.0 - 36.0[3]
Radium 226	pCi/l	58	<0.2 - 5.9[3]

[1] Adapted from GMMV (1994); water quality values from Sites C1, C2, and CC2.

[2] mg/l = milligrams per liter
mg/l HCO_3 = milligrams of bicarbonate per liter
mg/l CO_3 = milligrams of carbonate per liter
meq/l = milliequivalents per liter
s.u. = standard units
umhos/cm = microohms^{-1} per centimeter
°C = degrees Celsius
ppb = parts per billion
pCi/l = picocuries per liter

[3] Range exceeds WDEQ Class A, Fish/Aquatic Life Concentration Standard (WDEQ 1980); (see Section 3.1.5.2, Table 3.11).

3.1.5.2 Groundwater

Introduction. The Green Mountain area has been mapped by Love (1970) and Schmidt (1979a, 1979b); Steele (1985) described the complex lithology of Eocene sediments found in the area. Additionally, from the late 1970s through 1991, exploration drilling has been conducted to identify subsurface conditions, including the character and extent of potential ore zones. These data provide an understanding of the hydrogeologic conditions of Green Mountain.

Hydrogeologic data collected from wells and boreholes between 1980 and the present have been used to characterize groundwater systems in the area (GMMV 1994). Data have been collected from pumping tests and slug tests; core samples have been extracted for permeability tests; and water level readings have been monitored. Three series of groundwater monitoring wells have been drilled on Green Mountain. Map 3.3 shows the locations of these monitoring wells.

Geologic Framework. The structural geology of the Crooks Gap-Green Mountain District is complex, with numerous faults throughout the district. Rocks exposed in the Green Mountain area are from two formations, the Crooks Gap Conglomerate and the underlying Battle Spring Formation.

The Crooks Gap Conglomerate consists primarily of large granite boulders imbedded in pink to grey arkosic sandstones and siltstones (Love 1970). The formation is highly variable in nature, consisting of extremely hard granitic cobbles and boulders in a lightly to heavily cemented matrix. This formation extends downward from the top of Green Mountain approximately 1,500 feet, forming the resistant high areas of Green Mountain (GMMV 1994). The coarse and varied nature of the sediments indicates that deposition took place in a high-energy environment near the source area and at the apex of an extensive paleo-alluvial fan (Love 1970, Steele 1985).

The Battle Spring Formation consists of a thick sequence of conglomerates, sandstones, and siltstones. It consists mainly of coarse, white to tan, arkosic sandstone and conglomerate with beds of granite boulders interbedded with occasional carbonaceous materials. Because the formation was deposited in a fluvial system, the lithology is highly variable. Interbeds of mudstone and claystone, along with lenses of large granite boulders have been identified (Love 1970, Steele 1985, Taucher 1992). Love (1970) describes Battle Spring Formation uranium deposits in the Crooks Gap area as impregnating an "arkosic sandstone, fine-grained conglomerate, and carbonaceous siltstone along lenses and beds to depths of at least 1,400 feet."

The Crooks Gap Conglomerate and Battle Spring Formation are believed to be separated by an unconformity, which corresponds in location to a widespread mudstone unit (identified from geophysical logs) at an elevation of approximately 7,600 feet (GMMV 1994). The strata that make up these formations include poorly sorted, generally fine-grained, conglomerates, sandstones, siltstones, and mudstones laid down as lenses which make up an extensive series of fans. Because all of these rocks are discontinuous, well-indurated, and have low permeabilities, none are classified as an aquifer. The mudstone and siltstone lithologies have the greatest areal extent, and form discontinuous barriers to groundwater movement. As a result, Green Mountain contains a series of perched aquifers which are hydraulically separate. The springs and seeps found on the mountain flanks represent discharge zones from these perched aquifers, and most occur above proposed mining areas.

Hydrogeology. A continuous water table aquifer does not occur in Green Mountain because of the lensoid character of the sediments (Love 1970). When these saturated sandstone lenses are penetrated by a well or excavation, they rapidly release water to the opening; however, these flows decrease as the saturated sandstone lenses are drained. Flows are ultimately controlled and limited by the lowest permeability within the sediments surrounding each saturated sandstone lense. As a consequence, hydraulic data from short-term pump tests will, if applied to long-term mine-inflow evaluations, lead to significant over-estimation. The inflows to any excavation will ultimately be controlled by the material with the lowest permeability.

Examination of geophysical logs from wells in the area indicates that the conglomeratic units and sandstones are commonly lenticular and interbedded with relatively thin silty mudstones (Taucher 1992). Examination of the available information indicates that these lenticular conglomerate and sandstone units do not interconnect either laterally or vertically (GMMV 1994).

Field investigations have indicated that there are three general groundwater systems in the vicinity of the proposed mine. These groundwater systems can be referred to as shallow (above 9,000 feet elevation; 20-25 feet deep), intermediate (between 8,200 and 9,000 feet elevation; 90-150 feet deep) and deep (below 8,200 feet elevation). A series of groundwater exploration wells placed along the line of the proposed mine declines and across the mountaintop have shown the presence of a series of perched aquifers and have also confirmed that the aquifer system is not continuous. Water level monitoring above the trial declines during and after their construction has shown that pumping has only affected water levels in the strata immediately adjacent to the excavations. The water level data indicate that the deeper groundwater systems are not directly linked to the shallow groundwater systems; consequently, water withdrawals from the deep aquifers would not draw down the shallow systems (GMMV 1994).

Hydrologic data from Green Mountain indicate that the multiple aquifer zones in the area are separated by zones where the strata are not fully saturated. The elevation of emergent seeps on the mountain cannot be related to water levels from monitoring data, and specific aquifers or groundwater flow systems cannot be defined (GMMV 1994). This indicates that multiple aquifers, many perched, occur in the upper strata of the mountain.

The hydrologic boundaries and extent of aquifers in the Jackpot Mine area of Green Mountain are basically the faults and outcrops of less permeable zones within the Crooks Gap Conglomerate and Battle Spring Formations. The faults located around the proposed mine area are far enough removed that they likely have little impact on the groundwater flow in the proposed mine area. Perched zones exist due to the less permeable zones within the Crooks Gap Conglomerate and Battle Spring Formations, and discharge occurs as springs, seeps, or wetland areas where the less permeable zones outcrop on the slopes of the mountain.

Recharge and Discharge. Wells completed in the Battle Spring Formation yielded hydraulic conductivity values ranging from a low of 0.01 feet per day (ft/day) (3.53×10^{-6} cm/sec) to a high of 2.24 ft/day (7.91×10^{-4} cm/sec). Slug tests of wells completed in the Battle Spring Formation yielded hydraulic conductivity values ranging from 0.009 ft/day (3.18×10^{-6} cm/sec) to 0.08 ft/day (2.82×10^{-5} cm/sec). Based on the results of both testing programs, the range of hydraulic conductivity values is three orders of magnitude. This is an indication of the variability within the formation and the associated hydraulic conditions (GMMV 1994).

Groundwater flow in the Green Mountain area is from high topographic areas to low topographic areas. The areas of recharge are generally limited to the top and upper slopes of the mountain, where rainfall and snowmelt waters infiltrate and percolate downward to the discontinuous, perched groundwater systems in the upper portions of the mountain. Areas of discharge from the perched aquifers are springs, seeps, or wetland areas on the upper slopes of the mountain and percolation to the groundwater system beneath the mountain (GMMV 1994).

Groundwater Quality. The results of groundwater quality analyses conducted on Green Mountain groundwater are presented in GMMV (1994), and are summarized in Table 3.10. Groundwater monitoring locations are shown in Map 3.3.

In general, groundwater quality from monitoring wells at the proposed Jackpot Mine site meets WDEQ Class III groundwater quality standards (Table 3.11); however, relatively high pH levels and nitrate and nitrite, aluminum, arsenic, chromium, copper, lead, and manganese concentrations were observed in certain monitoring wells and springs (Table 3.10).

Groundwater from the Battle Spring Formation is classified as a calcium-sodium bicarbonate type water, and has a similar chemistry to the surface water in and around the Jackpot Mine area. This indicates that a preponderance of surface streams receive their base flow from groundwater discharged from the Battle Spring Formation (GMMV 1994).

Radionuclide levels generally increase with depth and sampling showed elevated levels of radionuclides coincident with uranium mineralization zones in all wells. Seasonal variations in radionuclide concentrations were also observed, with higher levels generally occurring together with higher TDS levels in the summer. Radium 226 and radium 228 exceeded usage standards for WDEQ Class I, II, and III waters only three times during pumping tests; uranium concentrations never exceeded these standards (Tables 3.10 and 3.11) (GMMV 1994). Gross alpha levels were above Class I, II, and III water use standards only within mineralized zones. The data suggest that most water emanating from the vicinity of the ore zone does not have levels in excess of WDEQ-recommended limits of radionuclides, and thus, should require no treatment. However, water contained in select intervals with evident uranium mineralization and elevated concentrations of radionuclides will require treatment. An evaluation of the radionuclide monitoring program is included in GMMV (1994).

3.1.6 Noise and Odor

Ambient noise levels throughout the proposed project area are generally rural in nature, with the only appreciable noise associated with traffic along roadways, existing reclamation work being conducted at the Big Eagle Mine, occasional airplanes, and wind. An A-weighted decibel (dBA) measure is used to evaluate environmental noise, and common noise sources affecting ambient levels in the proposed project area include light traffic (50 dBA at 100 feet), and heavy equipment (90 dBA at 50 feet).

Although specific noise-level data are not available for the project area, human-made noise emanations are probably quickly buffered by wind and topography. The proposed project area probably has existing noise levels in the range described as "Grand Canyon (North Rim)" (wilderness) and "Farm in Valley" sites (Wyle Laboratories 1971). Median noise levels for those sites ranged from 19 to 39 dBA. Noise-sensitive areas within and adjacent to the proposed project area include sage grouse leks during the breeding season and occupied raptor nests (see Section 3.2.2).

No specific data on odors are available for the project area; however, odors present in the area, other than the natural odors of vegetation and wildlife, are likely associated primarily with existing roads and reclamation work. Occasional emissions from cars, trucks, and off-road vehicles (ORVs), and smells at livestock concentration areas, may also contribute to odors experienced on the proposed project area. Most odors in the area are likely to be quickly dispersed by wind.

3.2 BIOLOGICAL RESOURCES

3.2.1 Vegetation

3.2.1.1 Plant Communities

The project area lies in a transitional zone between sagebrush prairie at lower elevations and lodgepole pine woodland in the mountains. Two principle vegetation types occur on proposed disturbance

Table 3.10 Groundwater Quality, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Quality Parameter	Units[2]	No. of Analyses	Range
MAJOR CATIONS/ANIONS AND OTHER CONSTITUENTS			
Calcium	mg/l	23	11.0 - 52.0
Magnesium	mg/l	23	0.25 - 12.00
Potassium	mg/l	25	0.4 - 9.0
Sodium	mg/l	25	8.0 - 84.0
Hardness as $CaCO_3$	mg/l	19	44.0 - 112.0
Alkalinity as $CaCO_3$	mg/l	22	69.0 - 167.0
Sulfate	mg/l	25	0.7 - 113.0
Chloride	mg/l	25	0.9 - 29.0
Fluoride	mg/l	25	0.06 - 0.96
Bicarbonate	mg/l HCO_3	25	71.0 - 204.0
Major cations	meq/l	25	0.46 - 5.99
Major anions	meq/l	25	1.67 - 5.94
PHYSICAL CONSTITUENTS			
pH (lab)	s.u.	25	6.9 - 9.0[3]
pH (field)	s.u.	15	7.3 - 9.5[3]
Conductivity (lab)	umhos/cm	25	168.0 - 529.0
Conductivity (field)	umhos/cm	20	140.0 - 334.0
TDS	mg/l	42	88.0 - 670.0
Temperature (field)	°C	22	6.0 - 15.5
NUTRIENT SPECIES			
Ammonia	mg/l	25	0.02 - 12.70
Nitrate and nitrite	mg/l	25	0.2 - 16.1[3]

Table 3.10 (Continued)

Quality Parameter	Units[2]	No. of Analyses	Range
TRACE METALS (DISSOLVED)			
Aluminum	mg/l	25	<0.1 - 23.2[3]
Arsenic	mg/l	25	<0.001 - 0.269[3]
Barium	mg/l	25	<0.03 - 0.50
Boron	mg/l	25	<0.1 - 0.6
Cadmium	mg/l	23	<0.002 - <0.005
Chromium	mg/l	23	<0.02 - 0.07[3]
Copper	mg/l	23	<0.01 - 0.70[3]
Iron	mg/l	23	0.03 - 6.29
Lead	mg/l	23	<0.02 - 0.86[3]
Manganese	mg/l	23	0.25 - 12.00
Mercury	mg/l	23	<0.001[3]
Molybdenum	mg/l	23	<0.01 - 0.15
Nickel	mg/l	23	<0.01 - 0.04
Selenium	mg/l	25	<0.001 - <0.005
Zinc	mg/l	25	<0.01 - 2.93
RADIONUCLIDES			
Uranium	ppb	6	<0.002 - 0.340
Radium 226 and 228	pCi/l	34	0.0 - 5.6[3]
Gross Alpha	pCi/l	28	0.3 - 282.0[3]

[1] Adapted from GMMV (1994); water quality values from Sites TW-1 through TW-6.

[2] mg/l = milligrams per liter
mg/l HCO_3 = milligrams of bicarbonate per liter
mg/l CO_3 = milligrams of carbonate per liter
meq/l = milliequivalents per liter
s.u. = standard units
umhos/cm = microohms^{-1} per centimeter
°C = degrees Celsius
ppb = parts per billion
pCi/l = picocuries per liter

[3] Range exceeds WDEQ Class III groundwater quality standards (WDEQ 1980); (see Table 3.11).

Table 3.11 Relevant WDEQ Groundwater Quality Standards, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

	Quality Standards[2]			
Quality Parameter	Class I Domestic Use	Class II Agricultural Use	Class III Livestock Use	Class A Fish/Aquatic Life Concentration
Aluminum	--	5.0	5.0	0.1
Ammonia	0.5	--	--	0.02
Arsenic	0.05	0.1	0.2	0.05
Barium	1.0	--	--	5.0
Beryllium	--	0.1	--	0.011 - 1.1[3]
Boron	0.75	0.75	5.0	--
Cadmium	0.01	0.01	0.05	0.0004 - 0.015[3]
Chloride	250.0	100.0	2,000.0	--
Chromium	0.05	0.1	0.05	0.05
Cobalt	--	0.05	1.0	--
Copper	1.0	0.2	0.5	0.01 - 0.04[3]
Cyanide	0.2	--	--	0.005
Fluoride	1.4 - 2.4	--	--	--
Gross Alpha (pCi/l)[4]	15.0	15.0	15.0	15.0
Iron	0.3	5.0	--	0.5
Lead	0.05	5.0	0.1	0.004 - 0.15[3]
Manganese	0.05	0.2	--	1.0
Mercury	0.002	--	0.00005	0.00005
Nickel	--	0.2	--	0.05 - 0.4[3]
Nitrate	10.0	--	--	--
Nitrite	1.0	--	10.0	--
Selenium	0.01	0.02	0.05	0.05
Silver	0.05	--	--	0.0001 - 0.00025[3]
Sulfate	250.0	200.0	3,000.0	--
TDS	500.0	2,000.0	5,000.0	500.0 - 2,000.0[5]
Uranium	5.0	5.0	5.0	0.03 - 1.4[3]
Vanadium	--	0.1	0.1	--
Zinc	5.0	2.0	25.0	0.05 - 0.6[3]
pH (s.u.)[4]	6.5 - 9.0	4.5 - 9.0	6.5 - 8.5	6.5 - 9.0
Radium 226 and 228 (pCi/l)[4]	5.0	5.0	5.0	5.0

[1] Adapted from WDEQ (1980).
[2] Concentration reported in mg/l unless otherwise indicated.
[3] Dependent upon hardness.
[4] s.u. = standard units; pCi/l = picocuries per liter.
[5] Variable dependent upon life requirements (e.g., egg hatching, fish rearing).

areas within the WDEQ-LQD Jackpot Mine permit area: riparian and sagebrush. Scattered stands of lodgepole pine occupy the hillsides north of the portal area and access road.

Riparian vegetation is located on gentle slopes in deeply incised drainages and is dominated by grasses and forbs. Vegetative cover averages 73.5%; whereas litter and rock provide 24.5% cover. Bare ground averages 2.0% cover (GMMV 1994). The principal grass species are bluegrasses (*Poa* spp.). Tufted hairgrass (*Deschampsia caespitosa*), prairie Junegrass, wire grass (*Juncus* spp.), basin wildrye (*Elymus cinereus*), slender wheatgrass, bluebunch wheatgrass (*Elymus spicatus*), letterman needlegrass (*Stipa lettermanii*), and timothy (*Phleum* spp.) are also common. Sedges (*Carex* spp.) are also prevalent. Common forbs include thistle (*Cirsium* spp.), yarrow (*Achillea* spp.), dandelion (*Taraxacum* spp.), mountain thermopsis (*Thermopsis montana*), dock (*Rumex* spp.), and lupine (*Lupinus* spp.). Big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus* spp.), rose (*Rosa* spp.), and shrubby cinquefoil (*Potentilla fruticosa*) are the principal woody species.

The sagebrush type occupies uplands with predominantly south-facing aspects. Vegetation consists of big sagebrush and black sagebrush with grasses in the understory. Vegetative cover averages 28.0%, and litter and rock provide an additional 47.4% cover; percent bare ground averages 24.6 (GMMV 1994). The dominant grasses are prairie Junegrass, kingspike fescue (*Leucopoa kingii*), Idaho fescue, bluegrass, bottlebrush squirreltail (*Elymus elymoides*), letterman needlegrass, western wheatgrass, and bluebunch wheatgrass. Forbs include phlox (*Phlox* spp.), pussytoes (*Antennaria* spp.), wild buckwheat (*Eriogonum* spp.), scurfpea (*Psoralidium* spp.), lupine, stonecrop (*Sedum* spp.), sagebrush gilia, and haplopappus (*Haplopappus* spp.). Common woody plants include big sagebrush, black sagebrush, aspen (*Populus tremuloides*), and limber pine (*Pinus flexilus*).

Information on the vegetation present along existing and proposed transportation corridors was obtained from SCS data on the precipitation and soils of the area (personal communication, June 1993, with Tom Gustafson, Soil Scientist, SCS; SCS 1988). The climax vegetation type in upland areas is dominated by needle-and-thread, rhizomatous wheatgrasses, Indian ricegrass, bluebunch wheatgrass, Idaho fescue, and prairie Junegrass. The predominant shrubs are big sagebrush and silver sagebrush. Average annual production on lands in excellent condition during normal years ranges from 900 to 1,500 pounds per acre (see Table 3.3).

Vegetation on fan aprons and terraces is dominated by needle-and-thread, Indian ricegrass, bluebunch wheatgrass, western wheatgrass, slender wheatgrass, and mutton bluegrass. Silver sagebrush, black sagebrush, and big sagebrush are common shrubs, and average annual production on lands in excellent condition during normal years averages 1,000 to 1,800 pounds per acre (see Table 3.3).

Floodplain vegetation consists of western wheatgrass, slender wheatgrass, other rhizomatous wheatgrasses, bluebunch wheatgrass, needlegrass, needle-and-thread, alkali sacaton, and basin wildrye. Shrubs include greasewood (*Sarcobatus vermiculatus*) and big sagebrush, and average annual production on lands in excellent condition during normal years ranges from 1,100 to 1,800 pounds per acre (see Table 3.3).

The potential vegetation on sand dunes includes needle-and-thread, Indian ricegrass, thickspike wheatgrass, and silver sagebrush. Annual production on dunes in excellent condition during normal years averages 1,400 pounds per acre (see Table 3.3).

3.2.1.2 Wetlands and Riparian Habitats

Formal wetland delineations were completed for the permit and surrounding areas and for the Jackpot Mine Access Road and portions of the Anaconda Road (GMMV 1994). Potential wetland areas along the western portions of the Anaconda Road, along the Crooks Gap Wamsutter Road, and along alternative transportation corridors were identified using National Wetlands Inventory (NWI) maps (USFWS 1990).

Wetlands occur throughout the region, but only approximately 8.8 acres of wetlands are present in areas that could be disturbed by the proposed project (Table 3.12). Four main classes of wetlands occur in the project area: wet meadows, riparian scrub, montane wetlands, and riverine streambeds.

Wet meadows occur along stream channels, near springs, seeps, and beaver dams, and in poorly drained areas. The principal plant species include red top (*Agrostis stolonifera*), largeleaf-Avens (*Geum macrophyllum*), Nebraska sedge (*Carex nebraskensis*), other sedges (*Carex* spp.), tufted hairgrass (*Agrostis scabra*), Baltic rush (*Juncus balticus*), and sword-leaf rush (*Juncus eusifolius*). Larger wet meadows also may support scattered willow (*Salix* spp.) stands. Vegetative cover is high, ranging from 70 to 100% (GMMV 1994).

Riparian scrub communities occur along intermittent and ephemeral stream channels (GMMV 1994). Vegetation consists of willow, spring birch (*Betula* sp.), thinleaf alder (*Alnus tenuifolia*), red-oiser dogwood (*Cornus sericea*), and scattered cottonwood (*Populus* sp.) and aspen. Vegetative cover ranges from 70 to 100% (GMMV 1994).

Montane wetlands occur on top of Green Mountain and along higher elevation drainages (GMMV 1994). The overstory is composed of lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*), Englemann spruce (*Picea engelmannii*), and aspen. Tree cover averages 60%. Understory vegetation is dominated by small wing sedge (*Carex microptera*) and tufted hairgrass. Along drainages, understory vegetation is similar to that found in wet meadows and riparian scrub areas.

The only other wetlands in the project area occur primarily as intermittent and perennial riverine streambeds (most are semipermanently flooded) along Crooks Creek and its tributaries, Osborne Draw, and Eagles Nest Draw (USFWS 1990). These wetlands are vegetatively similar to the wet meadow and riparian scrub wetlands described above, and improvements to the Crooks Gap Wamsutter Road and construction of Alternative A and B transportation corridors would require crossing these wetlands.

3.2.2 Wildlife and Fisheries

The topography, water resources, soils, and vegetation on and adjacent to the WDEQ-LQD Jackpot Mine permit area and existing and potential transportation corridors provide habitats used by numerous wildlife species as discussed below.

3.2.2.1 Big Game Animals

Five big game species potentially occur on and adjacent to the WDEQ-LQD Jackpot Mine permit area and transportation corridors: elk, mule deer, white-tailed deer, pronghorn antelope, and moose. Although white-tailed deer occur in many riparian areas within the region, they are not common enough to be considered part of a designated herd unit by the WGFD and no crucial range types are present within the WDEQ-LQD permit area or along project-required roadways. Therefore, white-tailed deer are not discussed further in this EIS. WGFD data utilized in this EIS are primarily from 1992 (WGFD 1993a).

Elk. Elk in the region belong to three herd units: Green Mountain, Shamrock, and Steamboat (Map 3.4). The portions of the Shamrock and Steamboat Herd Units that occur within the area are of limited importance to elk (i.e., few elk

Table 3.12 Wetlands at the WDEQ-LQD Jackpot Mine Permit Area and Along Proposed and Alternative Transportation Corridors, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Wetland Type	Location	Approximate Acreage	Impact Anticipated
WDEQ-LQD MINE PERMIT AREA			
Wet meadow	Little Long Park, Section 33, T28N, R91W	65.5	No
Open water/wet meadow	Little Long Park, Section 33, T28N, R91W	1.8	No
Wet meadow	Round Park, NWNW, Section 4, T27N, R91W	0.2	No
Wet meadow/montane wetland	Round Park, SW, Section 4, T27N, R91W	15.6	No
Wet meadow/open water	Round Park, SE, Section 4, T27N, R91W	6.8	No
Wet meadow	Round Park, SE, Section 4, T27N, R91W	3.5	No
Riparian scrub	Sagebrush Park, SE, Section 5, T27N, R91W	0.6	No
Wet meadow	Fourth Creek Area, NW, Section 8, T27N, R91W	0.7	No
Riparian acrub	Fourth Creek Area, NW, Section 8, T27N, R91W	0.5	No
Riparian scrub	Fourth Creek, NE, Section 8, T27N, R91W	0.8	No
Riparian acrub	Fourth Creek Area, SE, Section 8, T27N, R91W	1.2	No
Wet meadow	Portal area, SW, Section 8, T27N, R91W	2.6	Yes
Riparian scrub	Fourth Creek, NW, Section 17, T27N, R91W	3.3	No
Wet meadow/open water	Fourth Creek, NW, Section 17 and NE, Section 18, T27N, R91W	8.7	No
Riparian acrub	Fourth Creek, NE, Section 18, T27N, R91W	3.2	No
Riparian scrub	Jost Creek Area, NW, Section 17, T27N, R91W	2.9	No
Riparian scrub	Jost Creek Area, SW, Section 17, T27N, R91W	0.7	No
Riparian scrub	Fourth Creek Area, SW, Section 8, T27N, R91W	0.3	Yes
Riparian scrub	Fourth Creek Area, SW, Section 8, T27N, R91W	0.2	Yes
Riparian scrub	Fourth Creek Area, SW, Section 8 and NW, Section 17, T27N, R91W	0.9	Yes
Riparian scrub/open water	Fourth Creek Area, NE, Section 18, T27N, R91W	2.9	No
Wet meadow	SE, Section 7, T27N, R91W	0.9	No

Table 3.12 (Continued)

Wetland Type	Location	Approximate Acreage	Impact Anticipated
JACKPOT MINE ACCESS ROAD			
Wet meadow	SE, Section 7, T27N, R91W	0.3	Yes
Riparian scrub	NW, Section 7, T27N, R91W	0.3	Yes
Wet meadow/riparian scrub	Taggart Meadows, NW, Section 1, T27N, R92W	0.3	Yes
ANACONDA ROAD			
Wet meadow	Taggart Meadows, NE, Section 11, T27N, R92W	0.3	Yes
CROOKS GAP WAMSUTTER ROAD			
Riverine streambed	Crooks Creek, SW, Section 20, T28N, R92W	0.3	Yes[2]
Riverine streambed	Crooks Creek, NW, Section 6, T27N, R92W	0.3	Yes[2]
Riverine streambed	Osborne Draw, SE, Section 28, T26N, R93W	0.3	Yes[3]
Riverine streambed	Eagle Nest Draw, NE, Section 16, T25N, R93W	0.3	Yes[3]
ALTERNATIVE A ROUTE			
Riverine streambed	Crooks Creek, NW, Section 24, T27N, R92W	0.3	Yes[4]
Riverine streambed	Crooks Creek Tributary, SW, Section 22, T27N, R92W	0.3	Yes[4]
Riverine streambed	Osborne Draw, SE, Section 26, T26N, R93W	0.3	Yes[4]
Riverine streambed	Osborne Draw, NE, Section 35, T26N, R93W	0.3	Yes[4]
Riverine streambed	Eagle Nest Draw, NW, Section 11, T25N, R93W	0.3	Yes[4]
ALTERNATIVE B ROUTE			
Wet meadow	Taggart Meadows, NE, Section 10, T27N, R92W	0.3	Yes[5]
Riverine streambed	Crooks Creek, NE, Section 17, T27N, R92W	0.3	Yes[5]
Riverine streambed	Crooks Creek Tributary, NW, Section 17, T27N, R92W	0.3	Yes[5]

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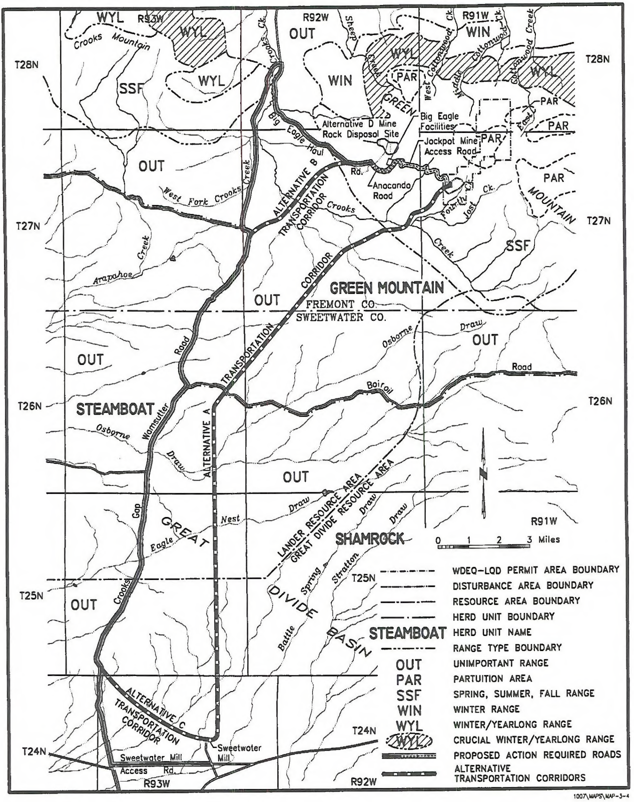
[1] Adapted from GMMV (1994) and USFWS (1990).
[2] Proposed Action and Alternative C only.
[3] Proposed Action and Alternative B and C only.
[4] Alternative A only.
[5] Alternative B only.



Map 3.4 Elk Ranges, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

occur in the area and/or important habitat is lacking); therefore, these herd units are not further discussed.

The Green Mountain Herd Unit consists of Hunt Area 24 (WGFD 1993a). The WGFD population objective for this herd is 500 animals, and the estimated end-of-year population in 1992 was 479, 21 elk below objective (WGFD 1993a). The estimated five year population average (1988-1992) for the herd is 540 elk, or 108% of objective. During the 1992 elk season, 135 animals were harvested from the herd.

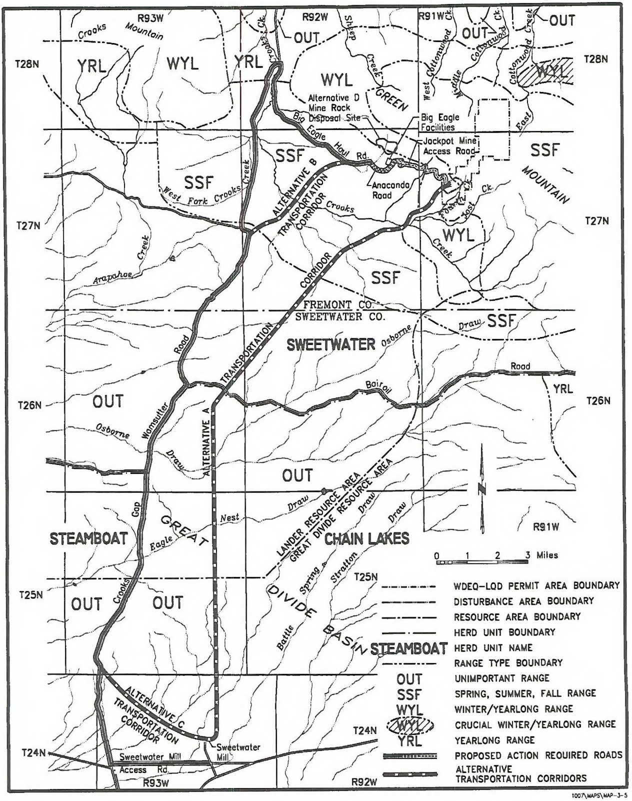
Spring-summer-fall elk range occurs over portions of the WDEQ-LQD permit area and transportation corridors (see Map 3.4). Spring-summer-fall range is that range used by a population or portion of a population annually except in winter, usually between May 1 and November 14 (WGFD n.d.; personal communication, Sue Oberlie, February 1995, Wildlife Biologist, BLM). Parturition areas occur on central and northern portions of the WDEQ-LQD permit area; however, none of these occur within 0.5 mile of proposed disturbance areas. Parturition areas are documented birthing areas commonly used by more than a few female members of a population (e.g., calving areas, fawning areas, lambing grounds) (WGFD n.d.). No crucial winter or winter/yearlong elk range occurs within one mile of the WDEQ-LQD permit area or transportation corridors, although crucial range is present north of the area (see Map 3.4).

Mule Deer. Mule deer in the WDEQ-LQD permit area and along transportation corridors are part of three herds: Chain Lakes, Steamboat, and Sweetwater (Map 3.5). The portions of the Chain Lakes and Steamboat Herd Units that occur within the area do not contain enough mule deer to be important habitat, or consist of habitats of limited importance to mule deer; therefore, these herd units are not further discussed.

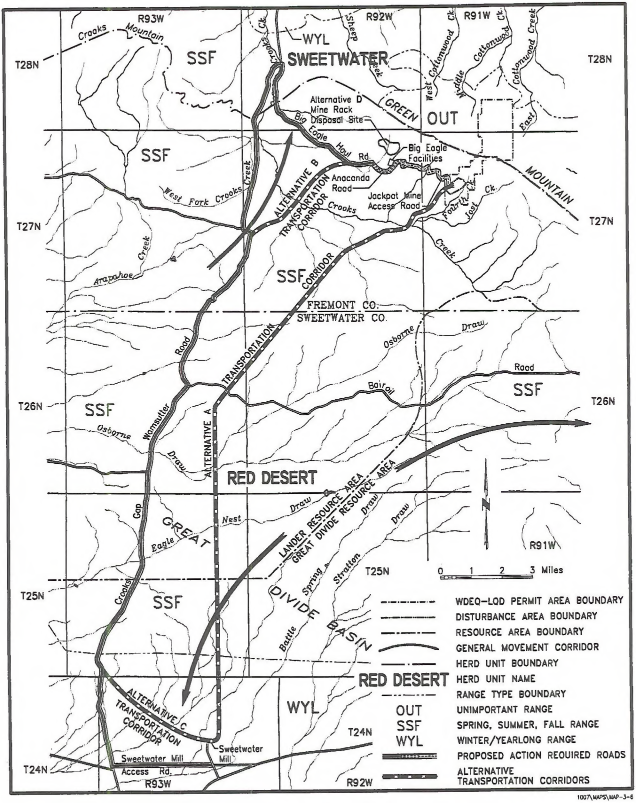
The Sweetwater Herd Unit contains Hunt Areas 96 and 97, although only Hunt Area 96 occurs within the WDEQ-LQD permit area and along the transportation corridors (Map 3.5) (WGFD 1993a). The WGFD population objective for this herd is 5,000 animals, and the estimated end-of-year population in 1992 was 5,592 (592 animals above objective) (WGFD 1993a). The five-year (1988-1992) estimated population average for the herd is 7,323 deer, or 146% of objective. During the 1992 mule deer season, 936 animals were harvested from the herd.

The majority of important mule deer habitats on the WDEQ-LQD permit area and along transportation corridors occur within spring-summer-fall and winter/yearlong ranges (see Map 3.5). Winter/yearlong range is that range of which a portion is used throughout the year, but during winter (i.e., November 15 to April 30) has a significant influx of animals from other seasonal ranges (WGFD n.d.; personal communication, Sue Oberlie, February 1995, Wildlife Biologist, BLM). The northern portion of the Big Eagle Haul Road and the Crooks Gap Wamsutter Road passes through yearlong mule deer range (see Map 3.5), which is that range used by a substantial portion of a population throughout the year (WGFD n.d.). Although crucial winter/yearlong range is present approximately 0.5 mile northeast of the WDEQ-LQD permit area, no crucial winter/yearlong mule deer range occurs within the area or along the transportation corridors.

Pronghorn Antelope. Pronghorn antelope, which are present over the majority of the project area, are part of two herd units, the Red Desert and Sweetwater Herds (Map 3.6). The Red Desert Herd Unit, which consists of Hunt Areas 60, 61, and 64, covers the southern half of the WDEQ-LQD permit area, the majority of the existing transportation corridor, and all of the alternative transportation corridors. The WGFD population objective for the Red Desert Herd is 12,000 animals, and the estimated end-of-year population in 1992 was 12,800 (800 animals above objective) (WGFD 1993a). The five-year (1988-1992) estimated population average for the herd is 12,495 pronghorn, or 104% of objective. During the 1992 pronghorn antelope season, 2,499 animals were harvested from the herd. The Sweetwater Herd Unit, which covers the northern



Map 3.5 Mule Deer Ranges, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.



Map 3.6 Pronghorn Antelope Ranges, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

half of the WDEQ-LQD permit area and the northernmost extension of the existing transportation corridor, consists of three hunt areas: 68, 69, and 106 (WGFD 1993a). Only portions of Hunt Areas 68 and 106 occur within the WDEQ-LQD permit area and transportation corridors. The WGFD population objective for this herd is 10,000 pronghorn, and the estimated end-of-year population in 1992 was 9,177 (823 animals below the objective) (WGFD 1993a). The five-year (1988-1992) estimated population average for the herd is 10,773 pronghorn, or approximately 108% of objective. The harvest of pronghorn during the 1992 season was 2,424 animals.

The southern half of the WDEQ-LQD permit area and the majority of the transportation corridors are spring-summer-fall pronghorn range, while the southernmost portion of the transportation corridors are considered winter/yearlong pronghorn range (see Map 3.6). The northern half of the WDEQ-LQD permit area consists of areas of very limited importance to pronghorn. No crucial winter or crucial winter/yearlong pronghorn range occurs within or adjacent to the WDEQ-LQD permit area or transportation corridors. Pronghorn tend to move north, east, and southwest out of the region and into adjacent areas of winter/yearlong range as winter approaches (see Map 3.6).

Moose. Moose within the WDEQ-LQD permit area and along northern portions of the transportation corridors belong to the Lander Herd (Map 3.7). The southern portions of the transportation corridors are of limited value to moose, and are not part of a designated herd unit.

The Lander Herd Unit consists of Hunt Areas 2, 29, 30, and 39, although only Hunt Area 39 occurs within the WDEQ-LQD permit area and along the transportation corridors (WGFD 1993a). The WGFD population objective for the Lander Herd is 450 moose; the estimated 1992 end-of-year population was 377 animals; 73 below the objective (WGFD 1993a). The five-year (1988-1992) estimated population average for the herd is 398 moose, or about 88% of objective. Thirty-seven animals were harvested from the herd during the 1992 moose season.

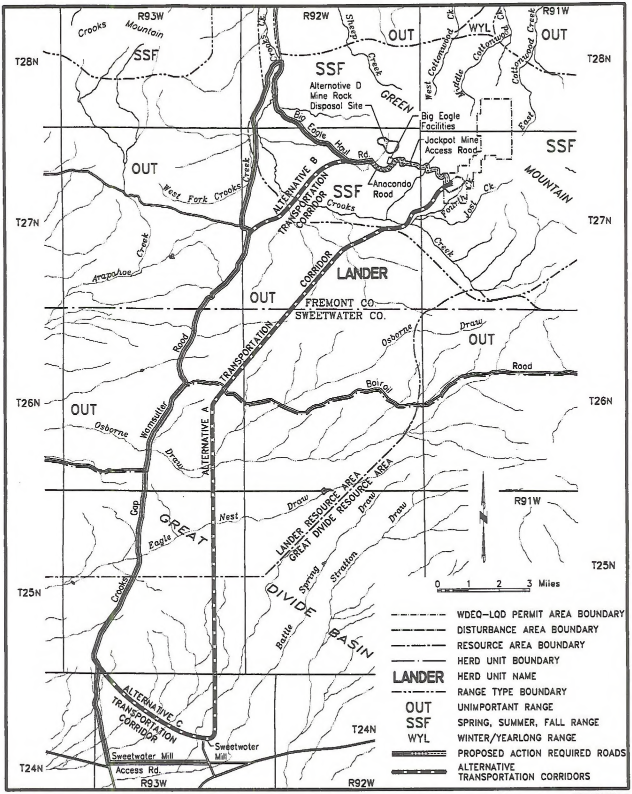
The WDEQ-LQD permit area and northern portions of the transportation corridors are considered spring-summer-fall moose range, encompassing areas on and adjacent to Green Mountain (Map 3.7). Moose located within this range type are concentrated within willow-dominated riparian corridors and immediately adjacent upland habitats (Clark and Stromberg 1987). The remainder of the transportation corridors are considered range of little importance to moose. No crucial moose range occurs within or adjacent to the WDEQ-LQD permit area or transportation corridors.

3.2.2.2 Raptors

All raptors and their nests are protected from take or disturbance under the Migratory Bird Treaty Act (16 U.S.C. 703-711) and Wyoming Statutes (W.R.S. 23-1-101 and 23-3-108). Certain species are also afforded protection under the Bald Eagle Protection Act (16 U.S.C. 668-688d) and Endangered Species Act (16 U.S.C. 1513-1543).

Raptor nest location maps are available for review at the BLM GDRA office in Rawlins and the BLM LRA office in Lander. Data gathered intermittently since 1977 indicate that ferruginous hawk (seven nests) and golden eagle (one nest) have nested within or immediately adjacent to the transportation corridors (WGFD 1993b, BLM 1993a). In addition, two artificial nest structures for golden eagles are located approximately one mile north of the Sweetwater Mill. These two raptor species commonly breed in Wyoming.

The numerous rock outcrops and cliffs on and adjacent to the WDEQ-LQD permit area and transportation corridors provide suitable substrates for raptor nesting, and all areas both within and adjacent to the WDEQ-LQD permit area and transportation corridors are considered suitable habitat for hunting, foraging, and perching by



Map 3.7 Moose Ranges, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

raptors. Recorded nest locations are concentrated along roads, which is probably a function of observer activity in these areas. Additional nests may exist within or adjacent to the WDEQ-LQD permit area and transportation corridors.

Since the activity status of raptor nests varies from year to year (Bent 1937; Mariah 1988a, 1988b), raptor nest surveys would be completed prior to and within one year of initiation of project activities. Construction and operation activities would be limited within a 0.75-mile buffer around active nests within or adjacent to the WDEQ-LQD permit area and transportation corridors during the nesting period.

The WGFD and Wyoming Natural Diversity Database (WNDDB) observation records indicate that several other raptor species make use of the WDEQ-LQD permit area and transportation corridors. Besides the golden eagle, year-round residents include the red-tailed hawk and prairie falcon. Cooper's hawk and short-eared owl are also occasionally seen throughout the year. Raptor species that inhabit the area only during the winter months include the relatively common rough-legged hawk and the occasional snowy owl. In addition to ferruginous hawk, summer-only residents of the area include northern harrier, Swainson's hawk, American kestrel, and turkey vulture. Merlin are very rare summer visitors to the area. Two observations of burrowing owls occurred in the vicinity of the Sweetwater Mill Access Road. Prairie dog colonies are present in this area, and therefore, burrowing owls may also nest in this area.

3.2.2.3 Upland Game Birds

Four species of upland game birds occur on and adjacent to the WDEQ-LQD permit area and transportation corridors: sage grouse, blue grouse, ruffed grouse, and mourning dove (BLM 1986a:134-136, WGFD 1993b). Chukar and gray partridge may also occasionally occur in the extreme northern portion of the area, but populations are generally concentrated north and northwest of the WDEQ-LQD permit area and transportation corridors; therefore, these species will not be further discussed.

Sage Grouse. Sage grouse habitat is found throughout the majority of lands on the WDEQ-LQD permit area and along the transportation corridors, except in the extreme northeastern areas on forested portions of Green Mountain. Sixteen known historic leks occur on and immediately adjacent to the WDEQ-LQD permit area and transportation corridors (WGFD 1993b, 1993c; BLM 1993a). Sage grouse leks are spring breeding areas to which birds return annually. The area within 0.25 mile of a lek is considered potential breeding habitat, while the area within two miles of a lek is considered probable nesting habitat. Small amounts of both of these habitat types occur within the WDEQ-LQD permit area and transportation corridors.

Spring sage grouse lek surveys conducted by the WGFD and BLM personnel revealed that nine leks on or adjacent to the WDEQ-LQD permit area and transportation corridors were active in 1992 (WGFD 1993c, BLM 1993a).

Blue and Ruffed Grouse. These two forest-dwelling upland game bird species are found on Green Mountain and on the eastern end of Crooks Mountain (BLM 1986a:135-136). Blue and ruffed grouse prefer such habitats as mountain shrubland, aspen-conifer woodland, quaking aspen woodland, Douglas fir forest, limber pine woodland, and lodgepole pine forest (BLM 1986a:135-136). Breeding, nesting, and brood-rearing areas for these two grouse species are typically found along the edges of these preferred habitats (BLM 1986a:135-136).

Forested areas and adjacent shrublands are present both within and around the WDEQ-LQD permit area and a small portion of the transportation corridors. Although the density of grouse within these areas is not known, appropriate habitat is available and it is assumed that grouse are present.

Mourning Dove. This common breeding bird species occupies habitats that occur within and adjacent to the WDEQ-LQD permit area and transportation corridors. The birds migrate from the area during the fall and winter. Mourning dove concentrations are usually highest around power lines, buildings, and other areas of human disturbance, which are not present on much of the area. Doves prefer the shrub-covered areas along perennial water sources, washes, and dunes that provide nesting and roosting cover.

3.2.2.4 Fisheries

Fisheries are limited, for the most part, to perennial drainages and sections of ephemeral/intermittent drainages located in the vicinity of the project area. The major perennial drainage in the vicinity of the WDEQ-LQD permit area and transportation corridors is Crooks Creek. Crooks Creek is a Class 3 trout stream containing a naturally reproducing population of brook trout (WGFD 1991). Class 3 trout streams are important trout waters, and fisheries of regional importance (WGFD 1991). Other Class 3 trout streams adjacent to the WDEQ-LQD permit area and transportation corridors which flow perennially in their lower reaches include East Cottonwood Creek and Willow Creek. Brook and cutthroat trout occupy the upper reaches of these streams, whereas brown and rainbow trout inhabit the lower reaches near their confluence with the Sweetwater River. Fourth Creek, a tributary of Jost Creek, flows southwest from the WDEQ-LQD permit area; it is a Class 4 trout stream with several beaver ponds, and contains a brook trout and Snake River Cutthroat trout fishery (WGFD 1991). Class 4 trout streams are low production trout waters that frequently contain fisheries of local importance, but that are generally incapable of sustaining substantial fishing pressure (WGFD 1991).

During 1993, fish sampling was conducted at three locations along Fourth Creek, one location along Jost Creek, and two locations along Crooks Creek in reaches that could be potentially affected by proposed mine operations (GMMV 1994). Brook trout was the only fish species observed during sampling (one fish was taken from Fourth Creek and five were taken from Crooks Creek). Fish ranged in length from 4.0 to 12.5 inches, were predominantly adults, and occurred primarily along stream reaches having gravel-cobble substrates with relatively greater pool habitats than at other sampling locations.

Other Class 4 streams located either on or adjacent to the WDEQ-LQD permit area and transportation corridors include Sheep Creek, the West Fork of Middle Cottonwood Creek, and Upper Willow Creek. That portion of the Sweetwater River into which all these streams flow is designated a Class 3 trout stream (WGFD 1991). Fishing pressure on all of the abovementioned streams is minimal, although two small man-made reservoirs southeast of the WDEQ-LQD permit area (i.e., immediately south of Green Mountain) are popular local fisheries and receive a moderate amount of use (personal communication, 1993, with Gary Long, Recreation Specialist, BLM LRA).

Several species of nongame fish inhabit streams in the vicinity of the project, including suckers (longnose and white), shiners (bigmouth and sand), creek chub, longnose dace, and Iowa darter (Baxter and Simon 1970). Additional species may also occur in these streams during periods of high flow.

3.2.2.5 Other Species

Based upon range and habitat preference (Clark and Stromberg 1987, WGFD 1992), eight mammalian predator species likely occur on or adjacent to the WDEQ-LQD permit area and transportation corridors. These are coyote, raccoon, long-tailed weasel, badger, western spotted skunk, striped skunk, mountain lion, and bobcat.

Also based upon range and habitat information (Clark and Stromberg 1987, WGFD 1992), two lagomorph species, desert cottontail and white-tailed jackrabbit, likely occur on and adjacent to the WDEQ-LQD permit area and transportation corridors. Other small mammals present likely include least chipmunk, Wyoming ground squirrel, thirteen-lined ground squirrel, white-tailed prairie dog, northern pocket gopher, olive-backed pocket mouse, Ord's kangaroo rat, deer mouse, northern grasshopper mouse, bushy-tailed woodrat, and several species of voles (e.g., southern red-backed, montane, long-tailed, prairie, sagebrush).

Common nongame birds that likely occur within and adjacent to the WDEQ-LQD permit area and transportation corridors, based upon range and habitat preference (WGFD 1992), include common nighthawk, Say's phoebe, western kingbird, horned lark, swallow (e.g., violet-green, barn), black-billed magpie, common raven, rock wren, mountain bluebird, loggerhead shrike, Brewer's sparrow, vesper sparrow, sage sparrow, lark bunting, McCown's longspur, western meadowlark, red-winged blackbird, Brewer's blackbird, common grackle, and brown-headed cowbird.

Several species of wading/shorebirds and waterfowl may occur along drainages and at ponds and impoundments on and adjacent to the WDEQ-LQD permit area and transportation corridors. Wading/shorebirds using these areas likely include great blue heron, killdeer, American avocet, and spotted sandpiper. Waterfowl species that may occur on and adjacent to the WDEQ-LQD permit area and transportation corridors include pied-billed grebe, American coot, Canada goose, mallard, green-winged teal, blue-winged teal, northern pintail, northern shoveler, gadwall, American wigeon, common merganser, and ruddy duck. Given the presence of appropriate breeding habitat, some of these species may occasionally nest within or adjacent to the WDEQ-LQD permit area or transportation corridors.

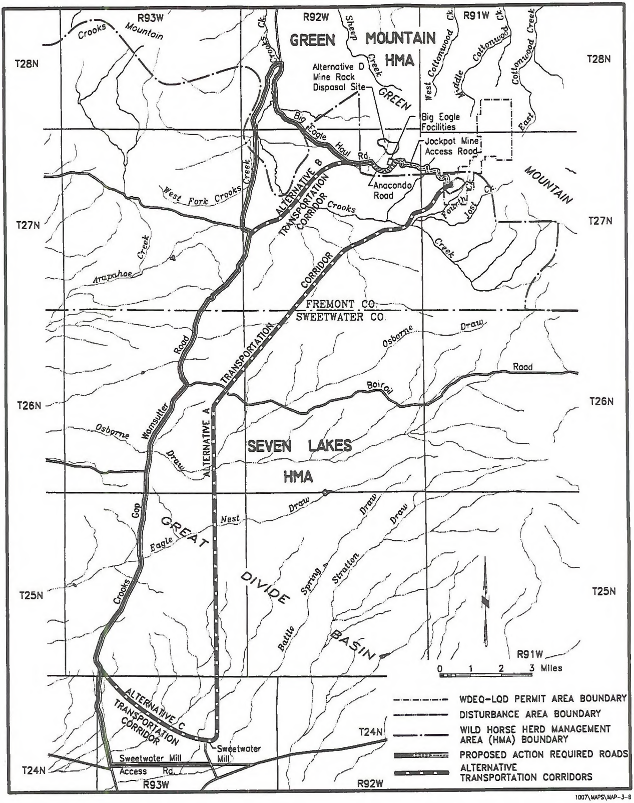
3.2.3 Wild Horses

The Wild Free-Roaming Horses and Burros Act of 1971 prohibits the capture or harassment of wild free-roaming horses and burros on BLM and U.S. Forest Service (USFS) lands. Protected horses and burros are to "be considered...an integral part of the natural system of the public lands" on areas where they were found in 1971, and are to be managed under the multiple use concept (16 U.S.C. 1331-1340, 1976 and Suppl. V 1981; Bean 1983).

Two wild horse herd management areas (HMAs) cover the WDEQ-LQD permit area and transportation corridors, the Green Mountain HMA and the Seven Lakes HMA (Map 3.8). Administrative and management responsibilities for the Green Mountain HMA are with the BLM LRA, while those for the Seven Lakes HMA are primarily with the BLM GDRA. The Crooks Mountain Herd, which occurs primarily in northern portions of the Seven Lakes HMA, is managed by the BLM LRA.

The Green Mountain HMA is located east of the Crooks Gap Wamsutter Road and covers northern portions of the WDEQ-LQD permit area and proposed transportation corridors (see Map 3.8). This HMA covers 88,000 acres of public land and in March 1993, had a wild horse population of 587 animals (personal communication, July 1993, with Roy Packer, Range Conservationist, BLM LRA; BLM 1992). This population has been increasing by about 21% each year, and was 287 horses above the maximum appropriate management level of 300 for the Green Mountain HMA in March 1993; the minimum appropriate management level for the HMA is 170 animals (BLM 1992). A round-up operation was conducted in August 1993 to reduce the wild horse population within the Green Mountain HMA to appropriate management levels, and 350 animals were captured and removed from the HMA (personal communication, October 1993, with Roy Packer, Range Conservationist, BLM LRA). The majority of the horses within the HMA are in the northern two-thirds of the HMA, in the immediate vicinity of Green Mountain. Horses generally summer on Green Mountain and winter north of the mountain on windblown ridges where forage is more available (BLM 1992). Horses may spend the entire year on Green Mountain during years with mild winters.

The Seven Lakes HMA covers southern portions of the proposed transportation corridors, a portion



Map 3.8 Wild Horse Herd Management Areas, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

of the Big Eagle Haul Road and Jackpot Mine Access Road, and southern portions of the WDEQ-LQD permit area, including all areas of disturbance associated with mining operations within the WDEQ-LQD permit area (see Map 3.8). This HMA has a wild horse population of 792 horses (as of February 1993), including 145 horses in the Cyclone Rim-Antelope Hills Herd and 264 horses in the Crooks Mountain Herd (personal communication, July 1993, with John Spehar, District Range Conservationist and Wild Horse Specialist, BLM GDRA). The population of this HMA is increasing at about 20% a year, and is currently about 600 horses above the maximum appropriate management level of 170; the minimum appropriate management level for the Seven Lakes HMA is 101 animals. Monitoring is presently ongoing to determine the appropriate number of horses to take in a roundup to meet management levels. The Crooks Mountain Herd inhabits northern portions of the HMA and generally occurs west of Crooks Gap Wamsutter Road, while the Cyclone Rim-Antelope Hills Herd is generally located west of the Crooks Mountain Herd. Eagles Nest Draw is a known concentration area for a portion of the Crooks Mountain Herd during the winter, although groups of horses may be scattered along the Crooks Gap Wamsutter Road throughout the year (personal communication, July 1993, with John Spehar, District Range Conservationist and Wild Horse Specialist, BLM GDRA).

3.2.4 Threatened and Endangered/Candidate/ Other Species of Concern

The Endangered Species Act protects listed T&E plant and animal species and their critical habitats. The USFWS was contacted to initiate informal consultation and obtain a list of T&E species potentially present on or adjacent to the WDEQ-LQD permit area and transportation corridors. Bald eagle, peregrine falcon, and black-footed ferret are the only T&E species that may occur in or adjacent to the WDEQ-LQD permit area and transportation corridors; however, numerous candidate species for federal listing, as well as other species of concern occur in or adjacent to these areas (Table 3.13).

No known bald eagle nests or winter roosts are present in or adjacent to the WDEQ-LQD permit area and transportation corridors. It is possible that bald eagles use trees and cliffs adjacent to the Sweetwater River several miles north of the WDEQ-LQD permit area and transportation corridors as winter roosting and/or perching sites; bald eagles require cliffs or large trees associated with concentrated food sources (e.g., fisheries, waterfowl concentration areas) or sheltered canyons for nesting or roosting areas (Edwards 1969, Snow 1973, Call 1978, Steenhof 1978, Peterson 1986). The lack of such habitat on or immediately adjacent to the WDEQ-LQD permit area or transportation corridors precludes its use as extensive nesting or roosting habitat. Migrating bald eagles and those potentially roosting along the Sweetwater River may occasionally use the WDEQ-LQD permit area or transportation corridors for foraging and perching; such use would likely be intermittent and for relatively short periods.

No known peregrine falcon nests occur on or immediately adjacent to the WDEQ-LQD permit area or transportation corridors, nor have any peregrine falcons been reported. Peregrine falcons nest on tall cliffs, usually within one mile of a stream or river or extensive brush or woodlands that provide concentrated food sources and open areas to hunt (Snow 1972, Call 1978). The absence of suitable cliffs in or adjacent to the area precludes peregrine falcon nesting, although the area may be used occasionally for hunting by migrating peregrines.

There is a single confirmed historic (i.e., 1973) black-footed ferret sighting approximately 0.25 mile north of the northernmost extent of the existing transportation corridor. White-tailed prairie dog colonies scattered throughout and adjacent to the WDEQ-LQD permit area and transportation corridors could provide a potential prey base and habitat for black-footed ferrets.

Table 3.13 Threatened and Endangered, Candidate, and Other Animal and Plant Species of Concern Observed Within and Adjacent to the GMMV Jackpot Mine and Transportation Corridors, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Common Name[2]	Location	Date of Last Observation	Status[3]
Mammals			
Black-footed ferret	Approximately 0.25 miles N of Big Eagle Road.	June 1973	LE, I-WYGF, SH, G1
Birds			
Bald eagle	Potential winter resident and/or migrant in the area	--	LE, S1B, S2N, G3
Black tern	Potential migrant and/or visitor to wetlands in the area	--	C2, II-WYGF, S2B, S3N, G4
Burrowing owl	0.5 mile from the Mill Access/Haul Road	October 21, 1975	C2, II-WYGF, S2, S3B, SZN, G5
	Approximately 2.5 miles E of Sweetwater Mill	July 21, 1988	
	Approximately 1.5 miles SW of Sweetwater Mill	October 7, 1975	
Ferruginous hawk	Numerous observations within and adjacent to the WDEQ-LQD mine permit area and transportation corridors	April 26, 1992	C2, III-WYGF, S4B, SZN, G4
Loggerhead shrike	Approximately 1 mile W of Crooks Gap Wamsutter Road	May 9, 1984	S4B, SZN, G4
Long-billed curlew	Potential migrant and/or visitor to wetlands/ grasslands in the area	--	3C, III-WYGF, S3B, S4N, G5
Merlin	Approximately 2.5 miles W of Crooks Gap Wamsutter Road	September 10, 1992	II-WYGF, S2, S3B, SZN, G4

Table 3.13 (Continued)

Common Name[2]	Location	Date of Last Observation	Status[3]
Mountain plover	Immediately adjacent to Crooks Gap Wamsutter Road	June 25, 1991	C1, S3B, S4N, G3
	Approximately 1.25 miles WNW of Crooks Gap Wamsutter Road	April 15, 1992	
	Approximately 1.75 miles W of Crooks Gap Wamsutter Road	April 15, 1992	
	Approximately 4.25 miles W of Crooks Gap Wamsutter Road	April 26, 1992	
Peregrine falcon	Potential migrant through the area	--	LE, S1B, S1N, G3T2
Upland sandpiper	Potential resident	--	II-WYGF, S2B, S3N, G5
White-faced ibis	Potential migrant and/or visitor to wetlands in the area	--	C2, I-WYGF, S1B, S2N, G5
Plants			
Beaver rim phlox (*Phlox pungens*)	Sparsely vegetated sites along the Sweetwater River and Beaver Rim	--	C2, WYLST 1, S2, G2
Bun milk-vetch (*Astragulus simplicifolius*)	Approximately 3.75 miles NNW of Crooks Gap Wamsutter Road	June 13, 1985	WYLST 2, S3, G3
Desert yellowhead (*Yerma xanthocephalus*)	Barren outcrops in the Beaver Rim area	--	C2, WYLST 1, S1, G1
Eburn's bladderpod (*Physaria eburniflora*) (Devil's Gate twinpod)	Approximately 4 miles SE of WDEQ-LQD mine permit area	July 27, 1983	C2, WYLST 1, S2, G2

Table 3.13 (Continued)

Common Name[2]	Location	Date of Last Observation	Status[3]
Meadow pussytoes (*Antennaria arcuada*)	Potentially occurs within the moist drainage bottoms of the area	--	C2, WYLST 1, S2, G2
Rocky Mountain twinpod (*Physaria saximontana* var. *saximontana*)	Open slopes in the BLM LRA	--	C2, WYLST 2, S2, G3T2
Slender seepweed (*Suaeda occidentalis*)	Approximately 2 miles SW of Mill Access/Haul Road	August 6, 1936	S2, G5
Small-flower fiddleneck (*Amsinckia menziesii*)	Approximately 4 miles NE of WDEQ-LQD mine permit area	June 30, 1985	WYLST 3, S2, G5
Wyoming point-vetch (*Oxytropis nana*)	Immediately adjacent to Crooks Gap Wamsutter Road	June 16, 1983	WYLST 2, S3, G3
	Approximately 3.25 miles N of Crooks Gap Wamsutter Road	July 3, 1985	

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[1] Sources: WNDDB (1991, 1993); WGFD (1993b). Personal communication, Charles Davis, June 1993, USFWS.

[2] Names in parentheses are those used by the WNDDB.

[3] Status definitions as given by the WNDDB (1991, 1993):

Federal Status:

LE = listed as federally endangered.

C1 = USFWS Notice of Review, Category 1. Species for which current information supports the biological appropriateness of proposing to list as endangered or threatened, but proposed rules have not yet been issued.

C2 = USFWS Notice of Review, Category 2. Species for which current information indicates that proposing to list as endangered or threatened is possibly appropriate, but insufficient information is on file to support an immediate ruling.

3C = USFWS Notice of Review, Category 3C. Taxa that were once considered for listing as endangered or threatened, but now no longer receive such consideration. Taxa are more widespread or abundant than previously believed, or are not subject to identifiable threats.

State Status:

I-WYGF = Priority I; includes federally endangered and threatened wildlife. Also includes species in need of immediate attention and active management to ensure that extirpation or a significant decline in the breeding population does not occur.

Table 3.13 (Continued)

II-WYGF = Priority II; includes species which are in need of additional study to determine whether intensive management is warranted or whether low-level management (such as monitoring population trends) will suffice. Until intensive management is necessary, low-level management will be implemented.

III-WYGF = Priority III; includes species whose needs should be accommodated in resource management planning; however, intensive management programs to maintain or enhance populations are not warranted at present. Populations of these species should be monitored to determine if low levels of management continue to be adequate. Knowledge of some of these species is often very limited.

WNDDB Status:

WYLST 1 = Highest priority; contains: 1) federally listed and proposed T&E species, and Category 1 and 2 candidates for listing (except where current data indicate such status is inappropriate); 2) species designated sensitive on federal lands, or that are being recommended for sensitive designation by the WNDDB, and 3) other species that are (suspected to be) quite rare and/or threatened globally or regionally (significantly disjunct), but that have no formal protective status.

WYLST 2 = Medium priority; contains: 1) species on designated watch lists for federal lands, or that are being recommended for watch lists by the WNDDB; and 2) other species that are (suspected to be) moderately rare and/or somewhat threatened globally or regionally.

WYLST 3 = Low priority; contains: 1) species that were previously considered higher priority for protection, but which have been downranked as new information has become available; and 2) species that are rare in Wyoming but common and secure in adjacent areas.

S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation within the state.

S1B = Statewide breeding status of S1.

S1N = Statewide non-breeding status of S1.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extirpation within the state.

S2B = Breeding status of S2.

S2N = Statewide non-breeding status of S2.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

S3B = Statewide breeding status of S3.

S3N = Statewide non-breeding status of S3.

S4 = Apparently secure in state with many occurrences.

S4B = Statewide breeding status of S4.

S4N = Statewide non-breeding status of S4.

SH = Historical occurrence in the state, perhaps having not been verified in the past 20 years, and suspected to still be extant. Upon verification of an existing occurrence, SH rank elements would typically receive an S1 rank.

SZN = Species which are not of significant concern when migrating through or wintering in Wyoming. This includes relatively uncommon migrants in the state with irregular, transitory, or dispersed occurrences. Includes rare species for which important habitats that could be protected are difficult or impossible to define. Also refers to abundant species wintering in, or migrating through, Wyoming.

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extinction.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 = Either very rare and local throughout its range, found locally (even abundant at some locations) in a restricted range, or vulnerable to extinction throughout its range.

G3T2 = Subspecies has G2 status.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the

Prairie dog colony mapping and burrow density determinations would be conducted on project-required lands prior to and within one year of construction operations, and if sufficient acreage and density of prairie dog colonies are present for potential black-footed ferret habitat (as defined in USFWS guidelines [1989]) in these areas, a search per the guidelines would be made in these areas to ensure that ferrets are not present in the area prior to disturbance.

Mountain plover, a C1 candidate species, have been observed in several locations both within and adjacent to the transportation corridors. Their preferred habitat, upland and lowland grasslands, occurs scattered over most of the project area. C1 Candidate species are those for which the USFWS has sufficient data to list as T&E, but for which proposed rules have not yet been issued.

Ferruginous hawk, a USFWS C2 Candidate species, have been frequently observed in the area. C2 species are those that are being considered for listing, but sufficient data are not available for a listing decision. Ferruginous hawks nest adjacent to the WDEQ-LQD permit area and transportation corridors as identified in Section 3.2.2.2. Data are currently being assembled on the ferruginous hawk to provide a basis for the decision on listing.

Burrowing owl, a newly listed C2 species, have been observed near the transportation corridor. The species nests in unoccupied mammal burrows, and likely nests in prairie dog burrows in the area.

Loggerhead shrike, formally a C2 Candidate species, has occasionally been observed within and adjacent to the WDEQ-LQD permit area and transportation corridors. This species prefers pine-juniper, woodland-chaparral, basin-prairie, and mountain-foothills shrublands (WGFD 1992). Locations immediately adjacent to drainages in the area provide this type of shrubby habitat, and it is likely that shrikes nest within or adjacent to the WDEQ-LQD permit area and transportation corridors.

Black tern, another C2 species, have not been observed near project-required lands. However, the species is known from the region and may utilize wetland/riparian areas along Crooks Creek during migrations. It is unlikely that the species nests near project-required lands.

There have been no recorded observations of long-billed curlew, a 3C species, either within or adjacent to the WDEQ-LQD permit area or transportation corridors. Category 3C species are those once considered for listing as T&E but which now no longer receive such consideration; they are more widespread or abundant than previously believed or are not subject to identifiable threats. Long-billed curlew prefer sagebrush-grassland and mountain-foothill habitats, especially those areas near water, for breeding and nesting (WGFD 1992). These habitats occur over much of the region, and curlew could potentially use these habitats in the WDEQ-LQD permit area, transportation corridors, and adjacent areas during breeding and nesting periods.

Three WGFD Priority II species have been observed or potentially occur on or adjacent to the proposed project area: merlin, loggerhead shrike, and upland sandpiper. Priority II species are those in need of further study to determine whether intensive management is necessary; low-level management is implemented until the determination decision is complete. Merlin have occasionally been observed adjacent to the existing transportation corridor, and are discussed in Section 3.2.2.2. Upland sandpiper, a species that prefers grasslands and grass pastures, has not been observed within or immediately adjacent to the WDEQ-LQD permit area or transportation corridors, but is known to occur in the region (WGFD 1992). Grassland habitats are common in the region, and this species could potentially use these habitats for foraging, breeding, and nesting activities.

Five C2 plant species, desert yellowhead, Beaver Rim phlox, Rocky Mountain twinpod, Eburn's bladderpod, and meadow pussytoes, are known to occur in the region surrounding the proposed project, but only Eburn's bladderpod has been observed near the project area. A search of WNDDB records revealed four additional plant species of concern occurrences within and adjacent to the existing transportation corridor: slender seepweed, Wyoming point-vetch, bun milk vetch, and small-flower fiddleneck. The WNDDB has assigned a state rank of S2 to slender seepweed and small-flower fiddleneck, indicating that they are imperiled in Wyoming because of rarity, or because of factors demonstrably making them vulnerable to extinction. Observations of these species occurred near the transportation corridor. Slender seepweed prefers alkaline areas (Dorn 1988), and these conditions occur along ephemeral draws both within and adjacent to the central and southern portions of the transportation corridors. Wyoming point-vetch and bun milk vetch, S3 species, were observed along the existing transportation corridor. A plant species assigned a rank of S3 is rare or local throughout its range or found locally in a restricted range. The Wyoming point-vetch found adjacent to the existing transportation corridor was located on a shale-sandstone sideslope with bluebunch wheatgrass, spoonleaf milkvetch (*Astragalus spatulatus*), and yellow wild buckwheat (*Eriogonum flavum*).

3.3 CULTURAL AND HISTORIC RESOURCES

Cultural resources, which are considered under the National Historic Preservation Act of 1966 and the Archaeological Resources Protection Act of 1979, are the nonrenewable remains of past human activity. The archaeological record of the project area has been partially examined through surveys, test excavations, ethnographic materials regarding extant Native American populations, and historic documents pertaining to the settlement and use of the area by Euro-Americans. The Eastern Shoshone and Ute were the primary Native American groups that used the project area. Human occupation in the region is believed to have begun as early as 12,000 years ago and has continued until the present. Cultural resources from the area are discussed below under three broad categories: the Prehistoric, Protohistoric, and Historic periods.

The BLM has contacted Native American groups known to have used lands in the project area to allow them to express their concerns about sites of religious or historical importance to their culture which may be present in the area and could be impacted by the proposed project. No sites of religious or historical importance have been identified by the Native American groups.

3.3.1 Prehistoric Resources

Throughout the prehistoric past, the project area was inhabited by small bands of aboriginal hunters and gatherers who exploited a wide variety of resources. Two chronological frameworks which are pertinent to the proposed project have been established for prehistoric cultural resources (Figure 3.2). Frison (1991) defines three broad temporal periods for the Northwestern Plains including from earliest to latest, the PaleoIndian, Archaic, and Late Prehistoric; Metcalf (1987) further subdivides the Archaic and Late Prehistoric period into specific phases for the Wyoming Basin.

The PaleoIndian period is associated with big game hunting, and includes a series of cultural complexes identified by distinctive large projectile points which are often associated with the remains of large, now extinct, mammals (e.g., mammoth, bison, camel, and other megafauna). The Archaic period (which is subdivided into the Early, Middle, and Late) is characterized by a range of smaller side-notched, stemmed, or corner-notched projectiles and by more generalized subsistence pursuits, including hunting of numerous species of animals and gathering of plant resources. This lifestyle continued throughout the Late Prehistoric period, which is marked by the technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. During the Archaic and Late Prehistoric periods, the project area was occupied by small bands of hunters and

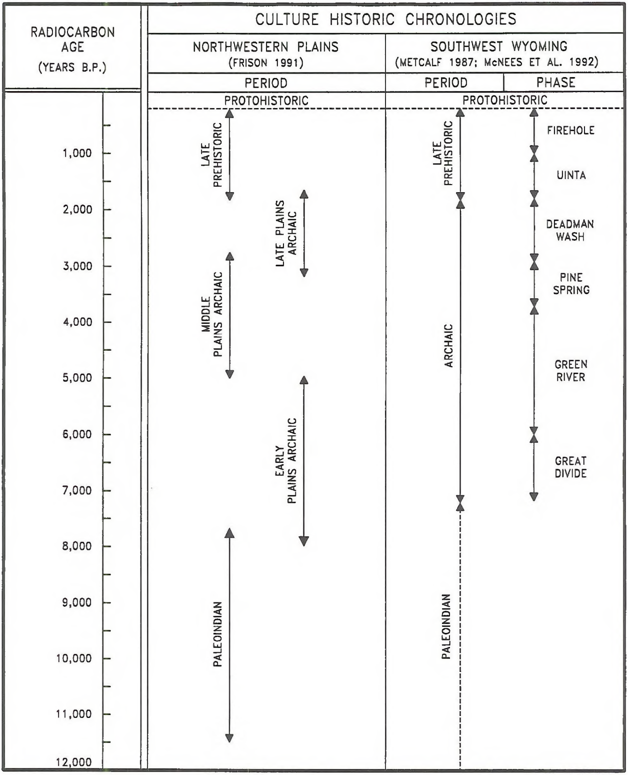

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Figure 3.2 Chronological Cultural History Framework for the Northwestern Plains, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

gatherers whose movements were patterned to a large degree by the seasonal changes in the occurrence of subsistence resources (BLM 1987b:99-100).

Common site types of the Prehistoric period include lithic scatters, stone circles, petroglyphs and/or pictographs, game drive lines, firehearths or firepits, lithic quarries, and rockshelter habitations (BLM 1986a). Past Class II inventories of south-central Wyoming have suggested the highest density of prehistoric sites occurs in association with dunes or permanent or semipermanent water sources (Metcalf 1976). Habitation sites with housepits dating to the Early and Middle Archaic periods have been documented just east of the Crooks Gap Wamsutter Road in excavations at Crooks Creek (McKern 1984), along the Sweetwater River near Split Rock to the north (Eakin 1987), and near Bairoil to the southeast (Hoefer 1988, Reust et al. 1993).

3.3.2 Protohistoric Resources

The Protohistoric period began around A.D. 1700, when European influences began to affect indigenous Native American groups. Site types of the Protohistoric period are similar to those of the Prehistoric period, but may include trade goods of metal or glass. The Shoshone was the primary Native American group in the region during the Protohistoric period.

3.3.3 Historic Resources

Historic land use began in the early 1800s when fur trading expeditions traversed the region. The general route of the fur trappers and traders was the Oregon/Mormon Trail, which was later travelled by thousands of emigrants moving to the western United States between the early 1840s and the 1860s (BLM 1986b). The Oregon/Mormon Pioneer Trail passes along the Sweetwater River less than 10 miles north of the proposed Jackpot Mine. Construction of the Union Pacific (UP) Railroad through the southern part of the region in the late 1860s provided a boost to the region's commerce. To connect the Wind River Indian Reservation with the UP mainline, a wagon road, the Rawlins-Fort Washakie Stage Road, was established (Gardner and Johnson 1987). The Rawlins-Fort Washakie Stage Road was used to transport supplies from Rawlins to the Indian Agency near present-day Lander, and use of the route continued to about 1906. The Stage Road intersects the Crooks Gap Wamsutter Road and follows the existing crowned-and-ditched road northward through Crooks Gap. The Stage Road would be crossed by the Alternative A and B transportation corridors.

Stock raising has been of major importance in the region from the 1880s to the present. Generally, areas north of Green Mountain were the domain of large cattle outfits, with the more arid areas to the south in the Great Divide Basin utilized mostly for sheep grazing (Rosenberg 1985). Site types of this period include foundations or structures marking homesteads or ranches, debris scatters representing ephemeral stockherding camps, and ranch features including fences, ponds, and roads. Foundations marking the Sparrowhawk Homestead occur just west of the Crooks Gap Wamsutter Road. Livestock grazing remains one of the chief land uses of the region to this day. Other historic uses of the region which continue to present day include oil and gas production and uranium mining.

3.3.4 Identified Cultural Resources

Class III cultural resource inventories of the proposed Crooks Gap Wamsutter Haul Road and the entire WDEQ-LQD Jackpot Mine permit area (see Map 1.2) were conducted in 1993 (Hatcher 1993, Goss 1993). Sixteen NRHP eligible prehistoric sites, one previously recorded eligible historic site (Rawlins-Fort Washakie Stage Road), and one previously recorded ineligible historic site were recorded along the Proposed Action haul route. Four previously recorded prehistoric sites and two isolated artifacts were found on or adjacent to the WDEQ-LQD Jackpot Mine permit area. One previously recorded site is recommended eligible for the NRHP, one is of unknown eligibility, and two sites are recommended ineligible.

A Class I inventory (SHPO File Search No. 16177) was completed for the alternative transportation routes and the data are on file at the BLM LRA and GDRA offices. Class III inventories of these areas have not been completed. Whereas, numerous cultural resource sites are expected to occur along these routes, no cultural landscapes, landmarks, or other large or unusual cultural manifestations are known or expected to occur.

3.4 SOCIOECONOMICS

The proposed Jackpot Mine project is located in southeastern Fremont County, Wyoming, and communities most likely to be affected by the project are Jeffrey City, Lander, and Riverton. Rawlins, which is located in Carbon County, may also be affected. Southern portions of proposed transportation routes from the mine to the Sweetwater Mill are located in Sweetwater County; however, because of the location of these routes, no communities in Sweetwater County are anticipated to be affected. Therefore, socioeconomic impacts from the proposed project are likely to be limited to Fremont and Carbon Counties and this discussion addresses only these counties.

3.4.1 Demography

3.4.1.1 Population Dynamics and Census Data

Wyoming's population increased from 332,416 to 469,557 (+41.3%) between 1970 and 1980 as people moved into the state seeking employment in mining, petroleum, and related industries (Table 3.14). Falling mineral prices in the early 1980s slowed the influx of job-seekers and resulted in significant unemployment. By 1990, Wyoming's population had declined to 453,588, 3.4% lower than the 1980 level (U.S. Department of Commerce [USDOC] 1992).

The population of Fremont County experienced growth of 37.5% from 1970 to 1980, much the same as that of Wyoming (Table 3.14); however, the population decrease from 1980 to 1990 was more dramatic in Fremont County (-13.7%) than Wyoming as a whole. Riverton and Lander experienced similar population decreases from 1980 to 1990 (-7.2% and -10.7%, respectively) and Jeffrey City experienced a population decrease of 93.4% during that same decade.

Carbon County exhibited population growth of 64.0% during the energy boom years from 1970 to 1980 and the subsequent slump in energy production between 1980 and 1990 resulted in a population decrease of 23.9% (Table 3.14). Rawlins exhibited a smaller increase in the 1970s (47.0%) as well as a smaller decrease in the 1980s (-18.8%).

3.4.1.2 Economic Base and Employment

Fremont and Carbon Counties and the State of Wyoming have all experienced economic problems since the early 1980s, with declines in employment, population, and personal income. In Fremont County, population decreased 14% and total employment decreased 17%, from 1980 to 1990. In Carbon County, population decreased 24% and total employment decreased 30%, from 1980 to 1990. Whereas annual per capita income in the U.S. increased 77% (to $17,592) between 1980 and 1990, annual per capita income in Wyoming increased only 28% (to $14,554) (Wyoming Department of Administration and Information [WDAF] 1991). Over the same time period, annual per capita personal income rose 10% (to $14,564) and 25% (to $11,869) in Carbon and Fremont Counties, respectively.

In 1980, the primary private economic base (number of people employed in each industry sector) of Fremont County was mining (3,975), construction (1,454), and agriculture (1,169). By 1990, the private economic base for Fremont County had shifted to agriculture (1,010), construction (952), and manufacturing (712) (WDAF 1991).

Table 3.14 Population Trends for Wyoming, Fremont and Carbon Counties, and Selected Communities, 1970-1990, GMMV Jackpot Mine Project, Wyoming, 1995.[1]

Location	1970	1980	1970-1980 Trend	1990	1980-1990 Trend
Wyoming	332,416	469,557	+41.3%	453,588	-3.4%
Fremont County	28,352	38,992	+37.5%	33,662	-13.7%
Jeffrey City	N/A	1,882	N/A	125[2]	-93.4%
Lander	7,125	7,867	+10.4%	7,023	-10.7%
Riverton	7,995	9,918	+24.1%	9,202	-7.2%
Carbon County	13,354	21,896	+64.0%	16,659	-23.9%
Rawlins	7,855	11,547	+47.0%	9,380	-18.8%

[1] Adapted from: Grafton and Brown (1988); USDOC (1981, 1992); Wyoming Department of Commerce (WDC) (1992).

[2] Approximate population as of July 1993 (personal communication, July 1993, Ron Wilmes, Jeffrey City businessman).

For Carbon County, the primary private economic base in 1980 was mining (3,567), construction (1,205), and agriculture (673). Over the next decade, the private economic base changed to mining (678), manufacturing (654), and agriculture (520) (WDAF 1991).

The April 1993 Fremont County labor force (persons 16 years of age and over) was 16,600, with 1,990 (12.0%) unemployed; the Carbon County labor force was 6,893, with 581 (8.4%) unemployed (personal communication, July 1993, Gordon Wolford, statistician, Wyoming Employment Security Commission [WESC]).

3.4.1.3 Housing

In 1990, the average number of year-round housing units available in Fremont and Carbon Counties was 14,437 and 8,190, respectively, with vacancy rates of 16.9% (2,435 units) and 26.7% (2,189 units), respectively (Table 3.15). Rental vacancy rates were 21.4% in Carbon County and 12.6% in Fremont County. Jeffrey City had approximately 111 housing units during the first half of 1993, with 45 (40.5%) occupied, and 66 (59.5%) vacant (Table 3.15). Jeffrey City has one motel (15 rooms) and two mobile home parks with a total of 700 available pads, all of which are vacant (personal communication, July 1993, Ron Wilmes, Jeffrey City businessman). Lander had a total of 2,890 housing units during 1990, with 2,635 (91.2%) occupied and 255 vacant (8.8%) (Table 3.15). Lander has nine hotels and motels (190 rooms) and one RV park (15 spaces). Riverton had a total of 3,870 housing units during 1990, with 3,467 (89.6%) occupied and 403 (10.4%) vacant (Table 3.15), as well as 15 hotels and motels (498 rooms) and three RV parks (48 spaces). Rawlins had a total of 3,948 housing units during 1990, with 3,280 (83.1%) occupied and 668 (16.9%) vacant (Table 3.15), as well as 17 hotels and motels (951 rooms) and three RV parks (400 spaces).

Table 3.15 1990 Housing Characteristics and Vacancy Rates, Fremont and Carbon Counties and Selected Communities, GMMV Jackpot Mine Project, Wyoming, 1995.[1]

Location	Total Housing Units	Mobile Home, Trailer, and Other	Occupied Housing Units	Vacant Housing Units	Homeowner Vacancy Rate (%)	Rental Vacancy Rate (%)
Fremont County	14,437	3,127	12,002	2,435	3.5	12.6
Jeffrey City	111	0	45	66	59.5	100.0
Lander	2,890	425	2,635	255	2.5	12.9
Riverton	3,870	434	3,467	403	3.6	11.0
Carbon County	8,190	1,804	6,001	2,189	5.7	21.4
Rawlins	3,948	560	3,280	668	5.7	21.2

[1] Source: USDOC (1992).

3.4.2 Infrastructure

3.4.2.1 Public Facilities and Services

Jeffrey City. Jeffrey City is a privately owned, unincorporated urbanized area located on U.S. Highway 287, approximately 12 miles northwest of the proposed Jackpot Mine. It was established as a company town for uranium mines and mills in the area, and has always been susceptible to boom and bust cycles related to the price of uranium. Jeffrey City is currently at the bottom of a cycle, with only 7% of the population it had in 1980 (see Table 3.14). There is currently a sheriff's deputy for the area, a volunteer fire department with 25 members, a post office, an emergency medical technician (EMT), and six basic emergency care providers. Jeffrey City has one school for grades kindergarten through 12. Commercial services include three convenience stores and restaurants and one motel (15 rooms). There are also two mobile home parks (700 pads) with utility hookups. Mountain Bell provides telephone service, electrical service is provided by the Hot Springs Rural Electric Association, and natural gas service is provided by Northern Natural Gas. Basic community services are in place to accommodate a population of approximately 2,000 people (personal communication, July 1993, Ron Wilmes, Jeffrey City businessman). The 1980 census recorded 1,882 residents in Jeffrey City (USDOC 1981).

Lander. Lander is located on U.S. Highway 287 and Wyoming Highway 789 approximately 70 miles northwest of the proposed Jackpot Mine. Primary local industries are agriculture (ranching, hay and grain), timber and logging, recreation, and tourism. Major employers are the Wyoming State Training School (735), Fremont County School District Number 1 (269), Fremont County Government (187), National Outdoor Leadership School (54/summer 200), and the Lander Valley Regional Medical Center (180). Lander has 19 full-time police officers, 39 volunteer firemen, and a 911 emergency system. Zoning regulations and building codes are administered by the town Planning Commission. A mayor/council form of government is in place and Lander is the county seat of Fremont County (WDC 1992).

Lander has five schools (three elementary, one junior high school, and one senior high school), a 55,000-volume city library, three day-care centers, a senior center, and 22 churches. Commercial services consist of nine hotel/motel units (190 total rooms), an RV park (15 spaces), and one convention center (750-person capacity). Medical care is provided by two hospitals (102 beds, 30% occupancy at the Lander Valley Medical Center, and 48 beds, 24% occupancy at the Psychiatric Institute of Wyoming) (Wyoming Department of Health [WDH] 1992), a nursing home (60 beds), 33 doctors, eight dentists, and an ambulance service. Communications include one local newspaper, cable TV, two radio stations, US West telephone service, and a first class post office (WDC 1992).

Recreational resources include three baseball fields, five tennis courts, a swimming pool, two bike paths, four soccer fields, a skating rink, a movie theater, a recreation center, and 12 parks. Sinks Canyon State Park is located seven miles from Lander, and the Wind River Mountains are 15 miles away. Electricity is supplied by Pacific Power and Light, natural gas by KN Energy, and water by the City of Lander. Solid waste disposal is available and the sewage treatment plant utilizes a lagoon system. Excess capacity exists in all utility systems in Lander (WDC 1992).

Riverton. Riverton is located approximately 70 miles northwest of the proposed Jackpot Mine on U.S. Highways 287 and 26. Primary local industries are construction and manufacturing, and major employers are School District Number 25 (455), D.H. Print (245), Central Wyoming Community College (236), and the Riverton Hospital (194). Law enforcement and fire protection services are provided by 27 full-time police officers and 46 volunteer firemen, and the city has a 911 emergency service. A City Planning Commission administers zoning regulations and building codes (WDC 1992).

Riverton has four elementary schools, one junior high school, and one senior high school. Central Wyoming Community College serves the Riverton/Lander area (WDC 1992). Other community services include two libraries (83,000 volumes), 15 day-care centers, two senior centers, and 26 churches. Commercial services consist of two shopping centers, 15 hotel/motels (498 rooms), and three RV parks (48 spaces). Health care facilities include one hospital (70 beds, 33% occupancy) (WDH 1992), one nursing home (90 rooms), 22 doctors, 11 dentists, and an ambulance service. Communication is provided by one local newspaper, four radio stations, and cable TV. Mountain Bell provides telephone service, and the town has a post office. Electricity is provided by Pacific Power and Light, natural gas by Northern Utilities, and water by the City of Riverton. Excess capacity exists in all utility systems (WDC 1992).

Recreational services consist of four baseball fields, five tennis courts, two swimming pools, a golf course, a bike path, four soccer fields, a skating rink, two movie theaters, and nine parks. Dispersed outdoor recreation such as hiking, hunting, fishing, camping, and boating are available in the Wind River Mountains approximately 35 miles west of Riverton (WDC 1992).

Rawlins. Rawlins is located along Interstate Highway 80 (I-80) in central Carbon County approximately 80 miles southeast of the proposed Jackpot Mine. Major industries are mining, manufacturing, and construction, and major employers are Carbon County School District Numbers 1 and 2 (643), UP Railroad (350), Memorial Hospital (300), Sinclair Oil Refinery (290), and the Wyoming State Penitentiary (289). Law enforcement and fire protection services are provided by 20 full-time police officers, eight full-time firemen, and 20 volunteer firemen; and the city has a 911 emergency service. A City Planning Commission administers zoning regulations and building codes and approves industrial plans (WDC 1992; Carbon County Chamber of Commerce 1992).

Rawlins has three elementary schools, a junior high school, and a senior high school. Western Wyoming Community College in Rock Springs serves Rawlins through the Carbon County Higher Education Center (WDC 1992). Community services include a library (60,000 volumes), two day-care centers, a senior center, and 16 churches. Commercial services include two shopping centers and a convention facility (1,000-person capacity). Medical care is provided by a hospital (93 beds, 31% occupancy) (WDH 1992), a nursing home (48 rooms), eight doctors, five dentists, and an ambulance service. Communications consist of a local daily newspaper, cable TV, two local radio stations, and a radio translator. US West and MCI provide telephone service, and Rawlins has a first class post office.

Recreational resources include six baseball fields, eight tennis courts, a swimming pool, a bike path, four soccer fields, a skating rink, a movie theater, a city recreation center, and eight parks. Outdoor recreational opportunities are present on nearby public lands administered by the BLM and 42 miles southeast in the Medicine Bow National Forest on lands administered by the USFS (WDC 1992).

Electrical service is provided by Pacific Power and Light, natural gas service by Northern Gas, and water by the City of Rawlins. The sewage treatment plant utilizes a lagoon system, and solid waste disposal is available. Excess capacity exists in all utility systems in Rawlins (WDC 1992).

3.4.2.2 Transportation

Surface transportation in Fremont County is provided by a network of primary, secondary, local, and primitive roads. U.S. Highways 287 and 26 and State Highways 789 and 28 are the principal roadways linking Fremont County communities with the rest of Wyoming. Lander is located approximately 70 miles northwest of the proposed Jackpot Mine Project area. Access is provided by way of U.S. Highway 287 to Jeffrey City (see Map 1.1). Riverton is also located approximately 70 miles northwest of the proposed Jackpot Mine Project area. From Riverton, access is provided on Wyoming Highway 135 to Sweetwater Station and then on U.S. Highway 287 to Jeffrey City.

Surface transportation in Carbon County is also provided by a series of primary, secondary, local, and primitive roads. I-80 is the principal roadway linking Carbon County communities with the rest of southern Wyoming and the national highway system. U.S. Highway 287 provides access from Rawlins to the north. Rawlins is approximately 76 miles southeast of Jeffrey City on U.S. Highway 287 (see Map 1.1).

South of Jeffrey City, access to the proposed mine is provided on the unpaved Crooks Gap Wamsutter Road (Fremont County Road No. 318 and Sweetwater County Road No. 4-23) (see Map 1.3). This road has a ROW width of 60 to 100 feet (BLM ROW WYW-76248), and an actual disturbance width of approximately 63 feet. Numerous two-tracks, primitive roads, and utility ROWs occur on BLM lands adjacent to the Crooks Gap Wamsutter Road.

Uranium would be transported from the proposed Jackpot Mine to the Sweetwater Mill for processing along the Jackpot Mine Access Road, Anaconda Road, Big Eagle Haul Road, Crooks Gap Wamsutter Road, and Sweetwater Mill Access Road and/or various transportation corridor alternatives (see Map 1.3). The Crooks Gap Wamsutter Road runs between the Big Eagle Haul Road and the proposed Sweetwater Mill Access Road (approximately 25.0 miles) (Map 1.3). The existing Big Eagle Haul Road links the Crooks Gap Wamsutter Road to the Anaconda Road (approximately 5.5 miles) and is privately owned and operated. The road was built to provide access to the Big Eagle Uranium Mine and shop facilities; it is approximately 91 feet wide and was constructed under BLM Manual 9113 standards (BLM 1985). The road would be used for mine access and ore hauling during project operations. Further access to the proposed Jackpot Mine would be provided by the Anaconda Road (1.4 miles) and the Jackpot Mine Access Road (2.3 miles) (see Map 1.3). The Anaconda Road has an existing 44-foot wide disturbance area and the Jackpot Mine Access Road has a 56-foot wide disturbance area. Both roads were constructed to

BLM 9113 standards (BLM 1985). An easement for the Anaconda and Jackpot Mine Access Roads has been obtained to allow for future road upgrades to accommodate ore hauling. Access to the Sweetwater Mill for this project would be provided by upgrading an existing two-track road (3.2 miles) linking the mill with the Crooks Gap Wamsutter Road or construction and/or upgrades of new transportation corridors (Alternatives A and C) between the mill and the Crooks Gap Wamsutter Road or the Jackpot Mine site. All road construction and upgrades required for the proposed project would conform to BLM 9113 road construction standards (BLM 1985).

The main line of the UP Railroad links Rawlins with the major east-west rail line through the central portion of the U.S. Rawlins has a large switchyard for this double-track system. Community airports are located at Lander, Riverton, and Rawlins. Commercial airlines service the Riverton airport. Charter service is available at Lander and Rawlins.

3.4.2.3 Local Government Revenues

Property taxes collected in Fremont County totaled $16,464,438 during the 1992 tax year, based on a total gross valuation of $209,711,671. Sales and use taxes for the county during the same year totaled $11,577,612. State severance taxes (6%) collected in the 1992 tax year totaled $7,140,274, based on a total valuation for crude oil, natural gas, and sand/gravel of $119,071,415 (Wyoming Department of Revenue [WDR] 1992). The state of Wyoming retains approximately 83% of the total state severance tax, with the remainder of these tax monies being returned to the county (personal communication, December 1993, Richard Marble, Director of the Mineral Tax Division, and February 1994, Richard Hopson, Mineral Tax Division, WDR).

Carbon County collected property taxes totaling $17,162,365 for the 1992 tax year, based on a total gross valuation of $238,791,907. Sales and use taxes (4%) for the county during the 1992 tax year totaled $3,681,644. State severance taxes (6%) collected within Carbon County for the same year totaled $9,108,628, based on a mineral valuation for crude oil, natural gas, coal-surface, coal-underground, limestone, and sand/gravel of $151,810,472 (WDR 1992). Federal mineral revenue is the largest revenue source for Carbon County (personal communication, May 1994, Jon Johnson, Natural Resource Specialist, BLM).

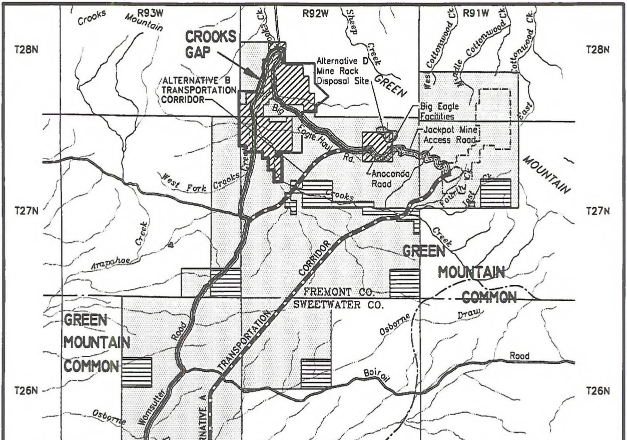
3.5 LAND USE

The proposed WDEQ-LQD Jackpot Mine permit area contains approximately 2,100 acres, all of which are owned by the U.S. and managed by the BLM LRA (Map 3.9). The BLM GDRA manages lands along southern portions of the proposed transportation corridors. Proposed transportation corridors cross a few areas of private and State owned land (Map 3.9) (GMMV 1994).

Past land uses in the Green Mountain area and along the proposed transportation corridors include livestock grazing, wildlife and wild horse habitat, recreation (e.g., hunting, hiking camping, wildlife and wild horse observation), mineral exploration and development (e.g., uranium mining, oil and gas production operations), and timber harvesting. The present principal land uses within the WDEQ-LQD mine permit area and along the transportation corridors are livestock grazing, wildlife habitat, and recreation. All BLM lands in the area are managed for multiple use.

3.5.1 Agriculture/Rangeland

Due to aridity and limited soil and water resources, livestock grazing represents the primary form of agriculture within the WDEQ-LQD Jackpot Mine permit area and along the proposed transportation corridors. Limited livestock grazing occurs within the WDEQ-LQD mine permit area due to limited forage availability and steep topographic conditions. Livestock grazing primarily occurs at lower elevations outside the WDEQ-LQD permit area and along proposed transportation corridors.



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Map 3.9 Landownership Patterns and Grazing Allotments, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Lands in the WDEQ-LQD permit area and along the transportation corridor are located in three grazing allotments--the Green Mountain Common, Crooks Gap, and Cyclone Rim allotments (Map 3.9). The Green Mountain Common allotment encompasses 517,240 acres, contains approximately 49,000 animal unit months (AUMs), and approximately 10 acres are required to provide one AUM. An AUM is defined as the amount of forage required to maintain a 1,000 pound cow and a calf under six months of age, five sheep, or 1.25 horses for one month. Both cattle and sheep are grazed on the allotment. The Crooks Gap allotment contains approximately 3,400 acres, 80 public land AUMs, and approximately 12 acres are required to provide one AUM. Cattle are the primary livestock species grazed on the allotment. The Cyclone Rim allotment contains approximately 292,000 acres, 27,000 AUMs, and approximately 11 acres are required to provide one AUM. Cattle, sheep, and horses are grazed on the Cyclone Rim allotment (personal communication, October 1993, with Mike Calton, Range Conservation Officer, BLM GDRA and John Likins, Range Conservation Officer, BLM LRA).

3.5.2 Wildlife Habitat

Big game species and habitats within the WDEQ-LQD Jackpot Mine permit area and along proposed transportation corridors include pronghorn antelope, mule deer, elk, and moose. Numerous small mammal and bird species also occur in the area. Discussions with personnel from the WGFD indicate that the areas proposed for disturbance at the mine site do not provide significant habitats for wildlife (GMMV 1994). Further detail on wildlife and wildlife habitats is provided in Section 3.2.2.

3.5.3 Recreation

Public land on and adjacent to the proposed project area is an important recreational resource for local residents and nonresidents. These areas offer a wide variety of recreational opportunities in diverse settings, including camping, sightseeing, ORV use, snowmobiling, hiking, fishing, hunting, rockhounding, and hang gliding (GMMV 1994). The Green Mountain region is a particularly important recreation area for the residents of Jeffrey City, Bairoil, Rawlins, and, to a lesser extent, the Lander, Riverton, and Casper areas. Residents of Jeffrey City and Bairoil possess a strong sense of ownership of Green Mountain (personal communication, Gary Long, February 1995, Recreation Specialist, BLM LRA). Green Mountain has three developed recreation sites: a campground and a picnic area operated by the BLM, and a campground operated by the Fremont County Recreation Board. However, no developed recreational sites occur within the WDEQ-LQD permit area or along the proposed transportation corridors.

While only limited recreational use data are available for the proposed project area, big game hunting is likely the predominate recreational activity. During the 1992 hunting season, 222 hunters pursued elk in the Green Mountain Herd Unit for a total of 1,125 recreational days. Mule deer from the Sweetwater Herd Unit were hunted by 1,394 hunters for a total of 3,706 recreational days. Pronghorn antelope from the Red Desert and Sweetwater Herd Units were hunted by a combined total of 3,822 hunters for 9,462 recreational days. The Lander Herd Unit (moose) was hunted for 236 recreational days by 40 hunters.

Virtually all of the fishing opportunities near the project area are provided by man-made reservoirs along the southern side of Green Mountain. Elsewhere in the vicinity, fishing opportunities are available on East Cottonwood Creek on the northern side of Green Mountain and the Sweetwater River north of Jeffrey City. Specific visitor use statistics are unavailable for these areas.

3.5.4 Land Status and Prior Rights

There are numerous prior authorizations for public lands on and adjacent to the WDEQ-LQD mine permit area and transportation corridors. Land authorizations in the area include mines, natural gas and oil developments, and power and communications ROWs. Development of the proposed project would occur on areas authorized for project operations by the BLM or other landowner, and rights to operate or develop other authorizations on the area would not be violated.

3.6 VISUAL RESOURCES

The visual quality of an area determines its desirability for a specific recreational activity by the public; however, the aesthetic value of the viewshed may also affect, to a lesser extent, other usually less sensitive, nonrecreational users of the land (e.g., public land lessees who graze livestock, gas field workers). The preservation of scenery by federal land agencies, in balance with responsible development, is central to visual resource management (VRM) programs.

The BLM's VRM system is an analytical process that seeks to identify, set, and meet objectives for maintaining scenic values and visual quality. VRM classes represent the degree of acceptable change within a characteristic landscape. A class is based on three factors (i.e., scenic quality evaluation, sensitivity analysis, and delineation of distance zones). VRM classes serve as management objectives and represent the relative value of the visual resource. Classes I and II are the most valued, Class III areas are of moderate value, and Class IV and V are of least value (BLM 1986c). The objectives of the five VRM classes are given in Table 3.16.

All project-related lands are within VRM Class III (53 acres), Class IV (188 acres), and Class V (177 acres) areas (Map 3.10); however, VRM Class II areas are present within the WDEQ-LQD Jackpot Mine permit area at locations where no disturbance would occur (Table 3.16).

Existing human disturbance within the vicinity of the proposed project has been extensive, and includes disturbances resulting from oil and gas explorations (e.g., well pads), roads, power lines, and past mining operations (e.g., Big Eagle surface uranium mine pits and facilities).

Table 3.16 Visual Resource Management Class Definitions, Acreage, and Percentage of Area, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Class	Definition[1]	Approximate Acreage[2]
Class I	Preserve the existing character of the landscape; although this class provides mainly for natural ecological change, limited development activity may be allowed in some areas, if the level of change to the characteristic landscape is very low and nearly unnoticeable. This class includes primitive (wilderness) areas, some natural areas, the wild sections of national wild and scenic rivers, and other congressionally and administratively designated areas where landscape modification activities are to be restricted.	0
Class II	Retain the existing character of the landscape; management activities may be seen, but should not attract the attention of the casual observer. Changes to the characteristic landscape should be low, and changes must repeat the basic elements (i.e., form, line, color, or texture) found in the predominant natural features of the existing landscape.	0[3]
Class III	Partially retain the existing character of the landscape; moderate changes to the existing landscape are allowed, although management activities associated with these changes should not dominate the view of the casual observer. As in Class II, changes should repeat the basic elements of the characteristic landscape.	53
Class IV	Provide for management activities that require major modification of the existing character of the landscape. Although management activities may dominate the view and be the major focus of viewer attention, every attempt should be made to minimize the impact of these activities through careful location selection, minimal disturbance, and repetition of the basic elements of the characteristic landscape. The relative change to the characteristic landscape can be high.	188
Class V	This class applies to areas where the VRM class has been reduced because of unacceptable intrusions. It should be considered an interim short-term classification until one of the other classes can be reached through rehabilitation or enhancement.	177
Total		418

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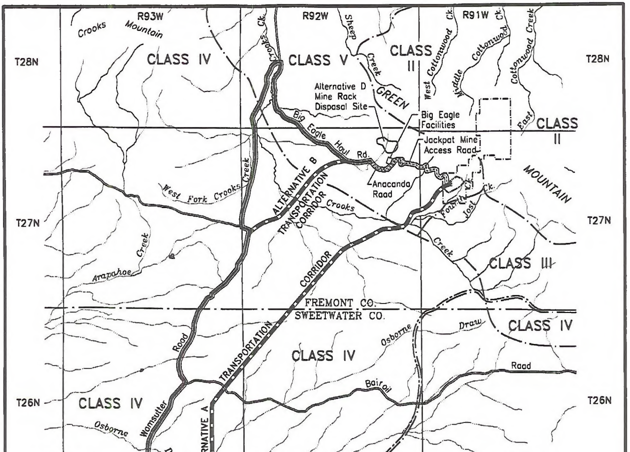
[1] Adapted from BLM (1986c).

[2] Values include all locations on project-required lands within the WDEQ-LQD mine permit area and along the transportation corridor under the Proposed Action alternative.

[3] Portions of the WDEQ-LQD Jackpot Mine permit area fall within a VRM Class II area; however, no disturbance would occur in the Class II area.



Map 3.10 Visual Resource Management Areas, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

The environmental consequences from the construction, operation, and reclamation of the proposed Jackpot Mine project are discussed below for each potentially affected resource under each alternative. Discussions of the impacts that can be reasonably expected from project implementation are included, and mitigation measures and residual impacts are discussed where appropriate. Impacts and mitigations are summarized in Table 2.7. Project-wide mitigation measures, presented in Sections 2.1.2.8 and 2.1.6, are part of the Proposed Action and alternatives, and impact analyses assume these measures would be effectively implemented. Additional mitigation measures are recommended for some resources to further minimize or avoid impacts; however, the BLM lacks authority to enforce some of these measures on private lands. Nevertheless, GMMV is committed to implementing the proposed project with public safety and environmental consciousness throughout the LOP insofar as landowner preference and agreement allow.

An environmental consequence or impact is defined as a modification in the existing environment brought about by development activities. Impacts can be beneficial or adverse, can be a primary result of the action (direct) or a secondary result (indirect), and can be permanent or long-lasting (long-term) or temporary and of short duration (short-term). Impacts can vary in degree from only slightly discernible to a total change in the environment.

The impact levels presented in this chapter are primarily based on the assumption that mitigation measures would be successfully applied. Mitigation measures summarized in Sections 2.1.2.8 and 2.1.6 are part of the Proposed Action and alternatives, and are included therein to reduce the level of potential impacts. These mitigations are further detailed in this chapter and are summarized in Chapter 5.0. All mitigation measures would become a binding part of the Plan of Operations for the Jackpot Mine.

Short-term impacts are the effects on the environment that would occur during and immediately after mine, facilities, and transportation corridor construction. Although short in duration, such impacts are normally obvious and disruptive. For this project, short-term impacts are defined as lasting five years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain longer than five years. Impacts that remain for the LOP and/or after reclamation has been completed would be considered long-term.

Potential impacts for this project were classified into five levels: significant, moderate, negligible, no impact, and beneficial. Significant impacts (as defined in CEQ guidelines 40 CFR 1500-1508) are effects that are most substantial and should receive the greatest attention in decision-making. Impact significance criteria are given for each affected resource. These criteria have been established based on existing regulatory standards, scientific and environmental documentation, and/or the professional judgement of resource specialists. Moderate impacts do not meet the criteria to be classified as significant, but nevertheless result in a degree of change that is easy to detect. Moderate impacts have the potential to become significant (e.g., excessive mine water discharge) if not adequately mitigated. Negligible impacts cause little or no effect to the existing environment and cannot be easily detected. Beneficial impacts are those that provide desirable situations or outcomes, whereas adverse impacts are those that do not. In the following discussion, impacts are considered adverse unless identified as beneficial.

Cumulative impacts are those that result from the incremental impacts of the proposed project added to past, present, and reasonably foreseeable future actions. The area considered for cumulative impact analyses varies, depending on the resource being analyzed, but includes, at a minimum, all lands directly affected by the proposed project. A review of development activities within 25 miles of the proposed project indicates that the majority of these developments occur within 8 miles of project-required lands. In addition, lands between 8 and 20 miles of the project have relatively little development; therefore, an 8 mile area surrounding project-required lands was considered as the cumulative impact assessment area for many resources.

Existing developments within approximately 8 miles of the project include six active oil and gas fields (approximately 186 acres of surface disturbance); partially reclaimed surface and underground mines (approximately 1,284 acres of existing disturbance); approximately 394 miles of improved roads (2,865 acres of disturbance); approximately 867 miles of unimproved roads (631 acres of disturbance); one community (Jeffrey City) with approximately 360 acres of disturbance; and the Sweetwater Uranium Mill and associated facilities (approximately 1,360 acres of disturbance) (Table 4.1). Total existing disturbance within 8 miles of project-required lands (i.e., an area encompassing approximately 476,000 acres) is approximately 7,201 acres, or less than 2% of the area. Additional developments proximal to project-required lands are likely to occur, but the extent of these potential future developments is unknown and they are not quantified in this EIS.

Existing and proposed surface disturbance resulting from the Proposed Action and alternatives is presented in Table 2.1. In summary, existing project-required disturbance would range from 130 to 404 acres, whereas new disturbance would range from 289 to 387 acres. LOP disturbance would range from 372 to 515 acres. The maximum acreage disturbed by the proposed project for the LOP (Alternative D) would be 515 acres and includes 404 acres of existing disturbance (see Table 2.1).

The No Action Alternative would require the BLM to deny the Plan of Operations for the proposed Jackpot Mine. Additional mining would not occur, roads would not be upgraded or built, and ancillary facilities would not be constructed, thereby precluding the recovery of mineral reserves under the Proposed Action and the development alternatives presented in this EIS. The No Action Alternative would essentially maintain the existing condition of the environment within the project area. No immediate impact to the existing environment would occur because no additional ground would be disturbed; however, existing claims on the area would be violated (see Section 4.1.3.7), and beneficial project impacts would not occur.

4.1 PHYSICAL RESOURCES

4.1.1 Climate and Air Quality

4.1.1.1 Significance Criteria

Significance criteria for impacts on climate were not established because no impacts are expected. Impacts to air quality would be considered significant if project activities result in a violation of federal and/or state air quality attainment standards (see Table 3.2) (WDEQ 1989).

4.1.1.2 Proposed Action

The WDEQ-AQD has adopted regulations for the attainment and maintenance of ambient air quality standards (WDEQ 1989). Section 21 of the Wyoming air quality control regulations requires any new or modified source of air contaminants to obtain a construction permit before work commences. Permitted sources must apply best available control technologies to all activities and operations with consideration of technical and economic practicability. The regulations list specific measures to be considered for large mining operations. Wyoming regulations for PSD apply only to enumerated point sources emitting more than 100 tons per year (tpy) of any pollutant and other point sources emitting more than 250 tpy of any pollutant. The PSD regulations do not apply to area and mobile sources (personal communication, June 1993, with B. Dailey, Engineering Supervisor, WDEQ-AQD). GMMV would obtain all necessary WDEQ-AQD permits

Table 4.1 Cumulative Disturbance Impacts, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Disturbance Type	Approximate Acreage Disturbed/Utilized	% of Total Known Disturbance
Proposed project[2]	515	7
Existing improved roads[3]	2,865	40
Existing unimproved roads[4]	631	9
Existing oil and gas fields[5]	186	2
Existing mine sites[6]	1,284	18
Sweetwater Uranium Mill[7]	1,360	19
Jeffrey City[8]	360	5
Total	7,201	100

[1] Includes all known existing and proposed disturbance within 8 miles of project-required lands (i.e., within an area occupying approximately 476,000 acres).

[2] Includes all existing and proposed areas necessary for implementation of Alternative D (this alternative requires the maximum acreage necessary for the proposed project). Existing, new, and LOP disturbance under the Proposed Action and other alternatives is presented in Table 2.1.

[3] Includes all improved roads within 8 miles of project-required lands (140 roads) and assumes existing disturbance occurs at a 60-foot width along the approximately 394 miles of existing improved roads.

[4] Includes all unimproved roads occurring within 8 miles of project-required lands (333 roads) and assumes existing disturbance occurs at a 6-foot width along the approximately 867 miles of existing unimproved roads.

[5] Includes an estimated 3.5 acres of existing disturbance per well at the 53 active wells in the six existing fields located within 8 miles of project-required lands.

[6] Includes disturbances at the Big Eagle, Crooks Gap, and other active and abandoned mines within 8 miles of project-required lands.

[7] Includes all areas required for the Sweetwater Uranium Mill and associated facilities.

[8] Assumes all lands within the town of Jeffrey City are disturbed.

and meet all regulatory requirements for the proposed mining activities and operations.

Impacts to the air quality in the vicinity of the proposed mining operation would result from several sources. The air pollutant that would be generated in greatest quantity would be particulate matter, and fugitive dust sources would account for most particulate matter emissions (Table 4.2). The greatest contributions would be from transportation-related sources (i.e., ore haul truck traffic and light- and medium-weight vehicles carrying personnel and equipment). Other particulate matter emissions would result from the transfer and stockpiling of ore, mine waste rock, and topsoil materials.

Access/Haul Roads. On a typical day, about 150 vehicle round trips between the Big Eagle support facility and the Jackpot Mine (7.2 miles) are expected. Application of EPA emission factors (EPA 1985) for vehicle traffic on these gravel access roads would result in TSP emissions of 0.83 - 1.51 tons per day (tpd) (207 - 517 tpy) (Table 4.2). TSP emissions would include a PM_{10} fraction of 0.29 - 0.55 tpd (78 - 189 tpy). Periodic application of water to control fugitive dust on the access roads would reduce particulate matter emissions by 40 - 90% (EPA 1985). Assuming the minimum 40% control efficiency, TSP emissions would be 0.50 - 0.91 tpd (124 - 310 tpy), and PM_{10} emissions would be 0.17 - 0.33 tpd (47 - 113 tpy) (Table 4.2).

Ore from the Jackpot Mine would be transported in covered 100-ton haul trucks from the mine to the Sweetwater Mill for processing (approximately 75 miles round trip). Approximately 30 round trips per day would be required, with a daily fleet mileage of approximately 2,244 miles. EPA emission factors (EPA 1985) for moderate truck speeds (35 mph) on rural, gravel roads estimate this traffic would generate 31.0 tpd (8,300 tpy) of TSP emissions, including 11.0 tpd (3,000 tpy) of PM_{10} (Table 4.2). Dust abatement measures with 40% control efficiency would reduce TSP emissions to 18.6 tpd (4,980 tpy), including 6.6 tpd PM_{10} (1,800 tpy).

Additional TSP and PM_{10} emissions would occur during road upgrade and maintenance operations. However, these emissions are expected to be negligible when compared with those resulting from traffic.

Particulate matter emissions from project-required traffic on proposed access and haul roads are expected to have moderate to significant adverse impacts to TSP, PM_{10}, and PSD maximum allowable increments of deterioration for particulate matter on and adjacent to these roads. The periodic application of water would reduce emissions, and the large area over which dust would be generated and dispersed would reduce impacts at any single location. In addition, the persistent strong winds of the area would further disperse particulates.

Ore Transfer. Ore would be removed from the underground mine via a conveyor system, and it is anticipated that ore handling would be completed in three or fewer transfers. All conveyor transfer points would be controlled by water sprays (GMMV 1994). Emissions estimates for the handling of 3,000 tpd of ore through three transfer points are 16.4 tpy of TSP, including 9.8 tpy of PM_{10}. Water sprays at transfer points would provide a 70 to 95% reduction of particulate emissions (EPA 1985). Assuming the minimum 70% control efficiency, annual emissions would be approximately 4.9 tpy of TSP, including 3.0 tpy of PM_{10}, and would have negligible impacts to air quality.

Stockpiling of Ore, Mine Rock, and Topsoil. Fugitive particulate matter emissions from the temporary ore stockpile, long-term stockpiles of topsoil, and the mine waste rock pile are anticipated. The maximum size of the ore stockpile would be 300,000 tons; topsoil stockpiles would contain approximately 144,000 yd^3 to 150,000 yd^3 of soil and cover an area of 8 to 10 acres at various locations along access roads and at the Jackpot Mine site. Additional topsoil stockpiles of unspecified volumes would also be present along upgraded segments of the Crooks Gap Wamsutter Road. The mine waste rock pile,

Table 4.2 Potential Fugitive Particulate Matter Emissions, Proposed Action and Alternatives, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Source	Uncontrolled TSP	Uncontrolled PM_{10}	Proposed Control Method	Estimated Control Efficiency (%)	Controlled TSP	Controlled PM_{10}
PROPOSED ACTION						
Light- and medium-duty vehicle traffic	0.83-1.51 tpd; 207-517 tpy	0.29-0.55 tpd; 78-189 tpy	Water application	40	0.50-0.91 tpd; 124-310 tpy	0.17-0.33 tpd; 47-113 tpy
Ore hauling	31.0 tpd; 8,300 tpy	11.0 tpd; 3,000 tpy	Water application	40	18.6 tpd; 4,980 tpy	6.6 tpd; 1,800 tpy
Ore transfer	16.4 tpy	9.8 tpy	Water application	70	4.9 tpy	3.0 tpy
Stockpiling activities	Unquantified (minimal)	Unquantified (minimal)	Snow fencing, water application	50	Minimal	Minimal
Total	8,523-8,833 tpy	3,088-3,199 tpy			5,109-5,295 tpy	1,850-1,916 tpy
ALTERNATIVE A[1]						
Ore hauling	18.0 tpd; 4,814 tpy	6.4 tpd; 1,740 tpy	Same	Same	10.8 tpd; 2,888 tpy	3.8 tpd; 1,044 tpy
Total	5,037-5,347 tpy	1,828-1,939 tpy			3,017-3,203 tpy	1,094-1,160 tpy
ALTERNATIVE B[2]						
Ore hauling	25.6 tpd; 6,856 tpy	9.1 tpd; 2,478 tpy	Same	Same	15.4 tpd; 4,114 tpy	5.5 tpd; 1,487 tpy
Total	7,029-7,389 tpy	2,566-2,677 tpy			4,243-4,429 tpy	1,537-1,603 tpy
ALTERNATIVE C[3]						
Ore hauling	29.2 tpd; 7,810 tpy	10.4 tpd; 2,823 tpy	Same	Same	17.5 tpd; 4,686 tpy	6.2 tpd; 1,694 tpy
Total	8,033-8,343 tpy	2,911-3,022 tpy			4,815-5,001 tpy	1,744-1,810 tpy
ALTERNATIVE D[4]						
Ore and waste rock hauling	36.8 tpd; 9,852 tpy	13.1 tpd; 3,561 tpy	Same	Same	22.1 tpd; 5,911 tpy	7.8 tpd; 2,137 tpy
Total	10,075-10,385 tpy	3,649-3,760 tpy			6,040-6,226 tpy	2,187-2,253 tpy

[1] Assumes a 42.0% decrease in fugitive dust emissions from ore hauling due to the reduced transport distance.

[2] Assumes a 17.4% decrease in fugitive dust emissions from ore hauling due to the reduced transport distance.

[3] Assumes a 5.9% decrease in fugitive dust emissions from ore hauling due to the reduced transport distance.

[4] Assumes a 18.7% increase in fugitive dust emissions from hauling activities due to the additional 7.0 mile round trip distance necessary for mine waste rock hauling.

which would extend an estimated 4,000 feet in length beyond the mine entrance at project completion, is expected to contain about 2,780,000 tons of material and would occupy 40 to 50 acres. While insufficient information is available to quantify particulate matter emissions from material stockpiles and recontouring and topsoil spreading operations, perimeter snow fences at some, and revegetation of all, topsoil stockpiles and watering of the active surface area of the mine waste rock pile and recontoured reclamations sites, would minimize wind erosion at these locations, reducing emissions to minimal levels (see Table 4.2). During reclamation, topsoil would be respread on disturbed areas and revegetated, the ore stockpile would be consumed, and the mine waste rock pile would be revegetated. Fugitive particulate matter emissions from these stockpiles and recontouring and topsoil spreading operations are expected to be negligible.

Power and Heat Supplies. Electrical power for most of the equipment associated with the mining activities would be supplied by a substation installed on the property during the exploration phase. Northern Gas of Wyoming would extend a natural gas service line to the Jackpot Mine site. A natural gas furnace, rated at an 11,000,000 BTU heat input per hour, would preheat air for underground ventilation approximately three months per year. Annual natural gas consumption is expected to be 26,500,000 standard cubic feet. A fuel combustion unit of this size is exempt from the Wyoming air permit requirement (WDEQ 1989). Emissions from the natural gas heater are estimated to be 1.9 tpy of NO_x, 0.5 tpy of CO, and negligible amounts of particulate matter, SO_x, and organic compounds (EPA 1985). These emissions would have negligible impacts on air quality. Electrical power would be generated off-site and would have no impact on air quality in the vicinity of the project.

Engines and Combustion Equipment. Various diesel- and gasoline-powered equipment would operate at the mine. Typical air pollutants from these mobile sources--NO_x, CO, hydrocarbons, and particulate matter--would be emitted. Amounts of emissions would depend on fleet composition, maintenance, and operating conditions; however, emissions would likely have negligible impacts to the air quality.

In the mine itself, much of the equipment would be operated by electricity. Vehicles operated underground would be diesel-powered, and auxiliary ventilation shafts would be installed during the later stages of mine construction to augment the ventilation capacity of the entrance/exit portals. Emissions from these ventilation exhaust shafts would be negligible.

Fuel Storage Tanks. Petroleum fuel products would be stored in aboveground tanks, with approximate storage capacities of 10,000 gallons diesel fuel, 5,000 gallons gasoline, and 20,000 gallons of other unspecified petroleum products. Emissions of volatile organic compounds from fixed-roof storage tanks depend on several variables, including tank size, shape, and condition, the vapor pressure of the organic liquid, fuel utilization rate, and atmospheric conditions (EPA 1985). Diesel storage is expected to result in negligible emissions of volatile organic compounds because of the low vapor pressure of the product. Gasoline and other petroleum products with higher vapor pressures would have higher hydrocarbon emissions; however, emissions rates from these storage tanks are expected to be negligible.

Emissions of Radionuclides. Unquantified amounts of airborne gaseous and particulate radioactive decay products, such as radon and radium, alpha particles, and uranium ore dust, can be expected from mine ventilation, the transfer and handling of ore materials, and from the mine waste rock pile (U.S. Department of Health and Human Services 1990). Because materials would not be stored in confined spaces, and because the mine site is isolated, the potential for adverse effects to public health are expected to be negligible. The controlled disposal of mine waste rock, the application of water to the ore stockpile and active mine waste rock pile, and adequate land reclamation of the mine waste rock pile would further reduce the potential for the generation of windblown dust containing radioactive substances from these sources.

Conclusions. Estimates indicate that particulate matter emissions from proposed mine activities would, for the most part, cause moderate impacts to air quality; however, significant impacts to air quality could occur along proposed haul routes in association with truck traffic during dry periods when dust control measures (water applications) are inadequate. The activity that would generate the most fugitive dust would be haul truck traffic between the mine and mill; however, fugitive dust from the haul trucks would be distributed over a wide area and no known receptors (i.e., residences) are adjacent to the route. Most of the TSP generated by haul trucks would settle within the immediate vicinity of the roadway. Dispersion of PM_{10} would depend on localized meteorological conditions. The impact to any particular segment of the travel route would be highly variable. Support vehicles traveling between the Big Eagle facility and the Jackpot Mine would also produce fugitive dust. Implementation of dust control measures on the access and haul roads and compliance with WDEQ-AQD permit guidelines for the proposed mining operation is expected to mitigate the impact of most emissions to moderate levels. Other identified sources of air pollutants (ore transfer, stockpiles, mobile sources, fuel storage) would have negligible impacts.

4.1.1.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Air quality impacts under Alternative A are expected to be the same as for the Proposed Action for mine access, ore transfer and stockpiling, mine waste rock and topsoil stockpiling, power and heat supplies, fuel storage, and radionuclide emissions (i.e., negligible). However, the shorter ore-hauling distance (21.7 miles for Alternative A vs. 37.4 miles for the Proposed Action) would result in a decrease of approximately 42% in fugitive dust production as compared to the Proposed Action. Controlled TSP emissions (40% control efficiency) would be 10.8 tpd (2,888 tpy) and controlled PM_{10} emissions would be 3.8 tpd (1,044 tpy) (see Table 4.2). Total controlled TSP and PM_{10} emissions under Alternative A would be 3,017 - 3,203 tpy and 1,094 - 1,160 tpy, respectively. Air quality impacts from ore hauling under this alternative are expected to be moderate; however, significant impacts could occur during dry periods when dust control measures are inadequate. Haul trucks would consume approximately 42% less fuel and produce 42% fewer exhaust emissions under this alternative.

4.1.1.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Air quality impacts under Alternative B are expected to be the same as for the Proposed Action for mine access, ore transfer and stockpiling, mine waste rock and topsoil stockpiling, power and heat supplies, fuel storage, and radionuclide emissions (i.e., negligible). However, the shorter ore-hauling distance (30.9 miles) would result in a reduction of approximately 17.4% in the fugitive dust and exhaust emissions as compared to the Proposed Action. Controlled emissions (40% control efficiency) of TSP and PM_{10} would be 15.4 tpd (4,114 tpy) and 5.5 tpd (1,487 tpy), respectively, and total controlled TSP and PM_{10} emissions would be 4,243 - 4,429 tpy and 1,537 - 1,603 tpy, respectively (see Table 4.2). Air quality impacts from ore hauling under this alternative are expected to be moderate; however, significant impacts could occur during dry periods when dust control measures are inadequate.

4.1.1.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Air quality impacts under Alternative C are expected to be the same as for the Proposed Action for mine access, ore transfer and stockpiling, mine waste rock and topsoil stockpiling, power and heat supplies, fuel storage, and radionuclide emissions (i.e., negligible).

However, the shorter ore-hauling distance (35.2 miles) would result in a reduction of approximate 5.9% in the fugitive dust and exhaust emissions as compared to the Proposed Action. Controlled emissions (40% control efficiency) of TSP and PM_{10} would be 17.5 tpd (4,686 tpy) and 6.2 tpd (1,694 tpy), respectively, and total TSP and PM_{10} emissions would be 4,815 - 5,001 tpy and 1,744-1,810 tpy, respectively (see Table 4.2). Air quality impacts from ore hauling under this alternative are expected to be moderate; however, significant impacts could occur during dry periods when dust control measures are inadequate.

4.1.1.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, air quality impacts would be the same as for the Proposed Action for mine access, ore transfer, stockpiling, and hauling, topsoil stockpiling, power and heat supplies, fuel storage, and radionuclide emissions (i.e., negligible); however, increased fugitive dust and exhaust emissions would result from the transport of the approximately 2.6 million tons of mine waste rock materials from the Jackpot Mine site to the Big Eagle pits (7.0 miles round trip) for disposal. Mine waste rock would be transported in covered 100-ton haul trucks. Estimated controlled emissions (40% efficiency) of TSP and PM_{10} along proposed mine waste rock and ore haul routes are expected to be 22.1 tpd (5,911 tpy) and 7.8 tpd (2,137 tpy), respectively, and total TSP and PM_{10} emissions are expected to be 6,040 - 6,226 tpy and 2,187 - 2,253 tpy, respectively. Air quality impacts from ore hauling under this alternative are expected to be moderate; however, significant impacts could occur during dry periods when dust control measures are inadequate.

4.1.1.7 No Action

No impacts to air quality beyond those presently existing in the project area would occur under the No Action Alternative. Existing disturbances at the proposed mine site and along required access roads would be reclaimed by GMMV as authorized under License to Explore 179LE.

4.1.1.8 Cumulative Impacts

As with the Proposed Action and other development alternatives, cumulative impacts to air quality due to construction and operation of the Jackpot Mine are expected to be moderate during project operations and for the LOP. However, the incremental effects of the proposed project in combination with other regional existing, proposed, and potential future projects in the area are not expected to significantly contribute to further regional deterioration of existing air quality. With the dissipating capabilities of wind throughout the region and the employment of mitigation measures (water application) designed to minimize fugitive dust emissions, federal and state ambient air quality standards would not likely be exceeded, except occasionally along proposed transportation corridors.

Regular maintenance of internal combustion engines, including mobile and fixed sources, would further minimize cumulative air quality impacts resulting from project operations in combination with other regional developments. Because neither the mine site nor access roads would be in nonattainment of federal and state air quality standards, and because the actual LOP area of disturbance (327 - 463 acres) is small, regional air quality would remain within federal and state air quality standards.

4.1.2 Topography/Physiography

4.1.2.1 Significance Criteria

Impacts to topography and physiography would be considered significant if disturbance permanently affects prominent landforms or surface drainage patterns (BLM 1986a:359-361 and 1987b:61-63).

4.1.2.2 Proposed Action

The primary impacts to topography and physiography resulting from the Proposed Action would be changes to the landscape due to the development of the mine site and upgrades to existing roads along the proposed transportation corridor. Total surface disturbance within the 125-acre fenced mine site would be 42 acres which includes 7 acres of existing disturbance. An additional 23 acres of existing disturbance at the Big Eagle Mine site would also be required for the Proposed Action. Impacts to topography at the mine site would result from construction operations, facilities siting, mine-water discharge settling ponds, the permanent mine waste rock pile, and topsoil stockpiles; most impacts are expected to be negligible to moderate for the LOP and beyond. However, the location of the mine waste rock pile in the No Name drainage basin and the associated permanent diversion of the ephemeral No Name Creek would have significant impacts on the topography in that drainage.

Upon completion of mining operations, the mine waste rock pile and the No Name diversion ditch would remain in place, and all disturbed areas would be recontoured, covered with topsoil, and revegetated to blend with the surrounding area per WDEQ and BLM reclamation criteria (see Appendix B).

Road upgrades at eight existing stream crossings and cut-and-fill operations along the proposed transportation corridor have the potential for impacting surface drainage patterns. However, impacts to topography and physiography along the corridor are expected to be negligible for the LOP and beyond, since road upgrades would adhere to specifications presented in Section 9113, Road Standards Manual, which requires restoration of surface drainage patterns with culverts, ditches, or other means during construction (BLM 1985, 1991).

Total new disturbance along the proposed transportation corridor would be 171 acres (see Table 2.1), and LOP disturbance along the corridor would be 271 acres. It is anticipated that road upgrades along the Anaconda Road (10 acres) and the Crooks Gap Wamsutter Road (181 acres) would remain after project completion. None of the proposed road upgrade activities would require moving large amounts of earth, and no prominent landforms would be destroyed; therefore, impacts associated with road upgrades would be negligible.

4.1.2.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Impacts to topography and physiography at the mine site and along access roads under Alternative A would be the same as for the Proposed Action (i.e., negligible to moderate for most activities and significant for the mine waste rock pile and associated permanent diversion of No Name Creek).

The development of a new transportation corridor linking the proposed mine with the Sweetwater Mill would have a moderate impact on area topography and physiography for the LOP and until the corridor is adequately reclaimed. Total new and LOP disturbance along project-required roads from the development of this alternative would be 269 and 225 acres, respectively (see Table 2.1), and five stream crossings would be required along the new corridor. Implementation of Alternative A would result in approximately 34% more (98 acres) new disturbance and 11% less (46 acres) LOP disturbance than the Proposed Action (Table 2.1). Cumulative land disturbance would be reduced under this alternative since some existing road disturbance in the vicinity of the proposed project would be reclaimed. In addition, the entire Alternative A transportation corridor would be reclaimed upon project completion, including the 16 acres of existing disturbance along the corridor.

4.1.2.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Impacts to topography and physiography at the mine site and along access roads under Alternative B would be the same as for the Proposed Action and Alternative A (i.e., negligible to moderate for most activities and significant for the mine waste rock pile and associated permanent diversion of No Name Creek).

The development of a new transportation corridor linking the Big Eagle Haul Road with the Crooks Gap Wamsutter Road would have a moderate impact on area topography and physiography for the LOP and until the corridor is adequately reclaimed. Total new and LOP disturbance from the development of this new corridor would be 50 and 30 acres, respectively (see Table 2.1), and three stream crossings would be required along this road. Road upgrades along the Crooks Gap Wamsutter Road south of its junction with the Alternative B corridor and along access roads would require 144 acres of new disturbance, 227 acres of LOP disturbance, and two stream crossings. Implementation of Alternative B would result in approximately 8% more (23 acres) new disturbance and 3% less (14 acres) LOP disturbance than the Proposed Action (see Table 2.1). The entire Alternative B transportation corridor would be reclaimed upon project completion.

4.1.2.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Impacts to topography and physiography at the mine site and along access roads under Alternative C would be the same as the Proposed Action and Alternatives A and B (i.e., negligible to moderate for most activities and significant for the mine waste rock pile and associated permanent diversion of No Name Creek).

The development of a new transportation corridor linking the Crooks Gap Wamsutter Road to the Sweetwater Mill would have a moderate impact on area topography and physiography for the LOP and until the corridor is adequately reclaimed. Total new and LOP disturbance from the development of this new corridor would be 52 and 31 acres, respectively (see Table 2.1), and no stream crossings would be required along this road. Road upgrades along the Crooks Gap Wamsutter Road north of its junction with the Alternative C Road and along access roads would require 120 acres of new disturbance, 226 acres of LOP disturbance, and four stream crossings. Implementation of Alternative C would result in approximately 1 acre less new disturbance and 3% less (14 acres) LOP disturbance than the Proposed Action (see Table 2.1). The entire Alternative C transportation corridor would be reclaimed upon project completion.

4.1.2.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Impacts to topography and physiography at the mine site and along access roads under Alternative D would be similar to those for the Proposed Action (i.e., negligible to moderate for most activities and significant for the mine waste rock pile and associated permanent diversion of No Name Creek); however, impacts would be reduced because most mine waste rock would not be disposed of at the mine site. Waste rock materials would be transported from the mine site to an existing pit at the Big Eagle Mine for disposal, thereby facilitating pit reclamation (a beneficial impact) and eliminating approximately 32 acres of disturbance at the proposed mine site. Impacts would remain significant at the proposed mine site, since there would still be a permanent diversion of No Name Creek around the mine site area. While the amount of disturbance at the Jackpot Mine site would be reduced from that of the Proposed Action under this alternative, the inclusion of existing disturbance at the Big Eagle Mine (approximately 97 acres) would increase the amount of area required for this alternative. Implementation of Alternative D would result in approximately 23% more LOP disturbance than the Proposed Action, since LOP disturbance includes some existing disturbance at the Big Eagle Mine (see Table 2.1). New and LOP disturbance (171 and 271 acres, respectively) along the proposed transportation corridor (under implementation of Alternative D) would be identical to that occurring under the Proposed Action.

4.1.2.7 No Action

No impacts to topography and physiography beyond those existing in the project area would occur under the No Action Alternative. Existing disturbances at the proposed mine site and along required access roads would be reclaimed by GMMV as authorized under License to Explore 179LE.

4.1.2.8 Cumulative Impacts

As with the Proposed Action and development alternatives, cumulative impacts to topography and physiography in and adjacent to the project area (within 8 miles) are expected to be significant at the mine site but negligible over the entire area. Cumulative impacts to topography and physiography would occur from existing (6,686 acres), proposed (515 acres maximum), and potential future developments (see Table 4.1). Existing (1,284 acres) and potential future surface mines in the area pose the most substantial impacts to topography and physiography in the region; however, no future mining operations other than the proposed project are known for the area and none are expected over the LOP, and existing mines in the area will be reclaimed under existing permit obligations or in the WDEQ Abandoned Mine Lands program.

Although there is widespread oil and gas development in the region, standard stipulations for construction and reclamation would be implemented, and cumulative impacts to topography or physiography from these developments are expected to be negligible. Surface drainage patterns would be maintained, and reclamation procedures would include regrading and recontouring disturbed areas to approximately original contours.

4.1.3 Mineral Resources

4.1.3.1 Significance Criteria

Impacts to mineral resources would be considered significant if a specific resource is depleted or if access to economically recoverable resources is restricted by the proposed project. The first criterion ranks as significant because resources used today are not available to meet future needs. The second criterion is consistent with mineral management goals specified in the BLM LRA RMP (BLM 1986a:32-40) and GDRA RMP (BLM 1987b:48-57).

4.1.3.2 Proposed Action

The depletion of recoverable uranium ore reserves from the Battle Spring Formation underlying the project area would be significant. An estimated 40,000 tons of uranium would be recovered and would not be available for future energy needs. The purpose of the proposed project is to obtain these resources and put them to beneficial use; therefore, while the impact would be significant, it would be beneficial, and no mitigation would be applied.

If gold or other trace minerals are found in economically recoverable quantities in association with the uranium reserves, GMMV's Plan of Operations for the proposed mine would likely be amended such that these resources could be recovered. Any modification to GMMV's Plan of Operations would require further NEPA documentation and associated public input. Therefore, impacts to gold or other trace mineral recovery operations from the Proposed Action are expected to be negligible (if reserves are not economically recoverable) or beneficial (if reserves are recovered).

There are no existing oil or gas wells on project-required lands, and existing leases above the proposed mine remain unexplored and their viability is unknown. If oil and gas lessees choose to develop leases above the proposed mine during the LOP, proposed mine operations may preclude oil and gas development and therefore, impart a significant impact to their recovery; however, GMMV's uranium claim predates oil and gas leases in this area and thus GMMV has priority for area development and mining.

There are no known coal reserves occurring on project-required lands; therefore, the proposed project would not preclude future coal recovery. Sand and gravel sources are present along the Crooks Gap Wamsutter Road; however, there are no known plans to mine these materials and it is unlikely that the development of proposed transportation corridors would preclude mining for these materials. Additionally, gravel from these sources could be used for development and maintenance of project-required roads. Therefore impacts from the Proposed Action on sand and gravel resources in the area would likely be negligible, and could be beneficial if these resources are developed.

4.1.3.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Under Alternative A, the total LOP area of surface disturbance would be reduced by 46 acres from the Proposed Action; however, impacts to mineral resources would occur at the same levels as those of the Proposed Action (i.e., significant and beneficial for uranium, negligible or beneficial for gold, negligible to potentially significant for oil and gas, negligible for coal, and/or negligible to beneficial for sand and gravel).

4.1.3.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Under Alternative B, the total LOP area of surface disturbance would be reduced by 14 acres from the Proposed Action; however, impacts to mineral resources would occur at the same levels as those of the Proposed Action (i.e., significant and beneficial for uranium, negligible or beneficial for gold, negligible to potentially significant for oil and gas, negligible for coal, and/or negligible to beneficial for sand and gravel).

4.1.3.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Under Alternative C, (i.e., a new transportation corridor linking the Crooks Gap Wamsutter Road with the Sweetwater Mill) the total LOP area of surface disturbance would be reduced by 14 acres from the Proposed Action; however, impacts to mineral resources would occur at the same levels as those of the Proposed Action (i.e., significant and beneficial for uranium, negligible or beneficial for gold, negligible to potentially significant for oil and gas, negligible for coal, and/or negligible to beneficial for sand and gravel).

4.1.3.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, the total LOP area of surface disturbance would be increased by 97 acres from that of the Proposed Action; however, impacts to mineral resources would occur at the same levels as the Proposed Action (i.e., significant and beneficial for uranium, negligible or beneficial for gold, negligible to potentially significant for oil and gas, negligible for coal, and/or negligible to beneficial for sand and gravel). An additional negligible impact would result from the disposal of mine waste rock in an existing Big Eagle pit, since mining at the disposal pit would be precluded.

4.1.3.7 No Action

Impacts to existing uranium resources under the No Action Alternative would be negligible; however, rights to develop uranium in the area as provided in GMMV's existing mineral claim would be a significant adverse impact and violate contractual agreements between the government and claimants. Under the No Action Alternative, uranium reserves would remain available for future recovery; however, an alternate energy resource may need to be developed to compensate for the loss of power that would be generated by the uranium reserves recovered by this project. In addition, gold, other trace minerals, and sand and gravel resources that could potentially be recovered would remain undeveloped, thereby negating potentially beneficial impacts. There would be no impact to coal, oil and gas, or other mineral resources under the No Action Alternative.

4.1.3.8 Cumulative Impacts

Cumulative impacts on the recovery of uranium by the proposed project and potential future projects would be significant and beneficial. Uranium is a nonrenewable resource that, once utilized, is not available for future energy needs. However, the nondevelopment of this resource may necessitate developing other energy sources to meet these demands.

Proposed project and other future regional developments would result in energy (e.g., fuel) consumption during operations. While the amount of energy consumption is unknown, the proportion of energy consumed relative to that contained in the recovered uranium resource would be minor, and therefore, cumulative impacts resulting from increased energy consumption from the proposed and potential future developments in the region would be negligible.

Cumulative impacts resulting from past, present, and potential future projects in the area are not expected to impact the development of coal and/or oil and gas resources beneath the proposed mine beyond the expected levels indicated under the Proposed Action and alternatives. Coal and/or oil and gas development on project-required lands is not anticipated in the near future.

Cumulative beneficial impacts to the development of other mineral resources in the area could occur as a result of improvements to local transportation networks and increased local demands (e.g., gravel). In addition, gold or other trace minerals found in association with uranium could potentially be developed in the future as a result of the proposed project. Road construction and the existence of ancillary facilities (e.g., power lines) may facilitate exploration for and recovery of other minerals. However, because the area is relatively remote, most resources would probably be of local importance only. Therefore, potential beneficial impacts would likely be negligible.

4.1.4 Geologic Hazards

4.1.4.1 Significance Criteria

Impacts to the project from geologic hazards would be significant if project facilities are damaged due to seismic events, landslides, subsidence, abandoned mines, or flooding. Impacts to geologic hazards would be considered significant if project activities resulted in reactivation of sand dunes, landslides, subsidence, abandoned mine fires, or increased flooding.

4.1.4.2 Proposed Action

Potential impacts to the project from geologic hazards are expected to be negligible for the LOP and beyond. The depth of the uranium reserves (i.e., greater than 2,000 feet below ground level) negates the potential for subsidence, and there are no known abandoned underground mines on project-required lands. Earthquake potential in the area is low, and thus, impacts from earthquakes are expected to be negligible. Further, surface structures and the underground mine would be designed and constructed such that moderate earthquakes (intensity VI to VIII on the modified Mercalli scale) would not damage facilities.

There is limited potential for subsidence at the ground surface above the declines in the portal vicinity (personal communication, July 1993, with John Abel, Engineering Geologist, Golden, Colorado). In the event of a roof failure in the declines or in rooms within the mine, the maximum height of collapse would be approximately seven times the height of the decline or room (personal communication, July 1993, with John Abel, Engineering Geologist, Golden, Colorado). Room height at the Jackpot Mine would be 10 to 12 feet, and therefore, the maximum height of collapse would be 70 to 84 feet. The only area where surface subsidence could occur is where the declines are within 70 to

84 feet of the ground surface, and these areas would be backfilled during mine reclamation, thereby precluding subsidence. In addition, mine design criteria require construction of stable support pillars during mining operations, and while it is anticipated that following mining there could be localized caving above the openings, no ground surface subsidence is anticipated.

Areas prone to landslides or flooding would be avoided, wherever possible, and all water conveyance structures at the mine site would be built to WDEQ and WSEO standards; therefore, impacts from landslides or floods would likely be negligible. Landslide areas located approximately one mile north of the portal site would not be impacted by the proposed project, and it is unlikely that construction or operation activities would cause slope movement or failure in this area. Landslide areas located along the Crooks Gap Wamsutter Road are not expected to become active as a result of the limited road upgrade activities that would occur in these areas. In addition, precautionary measures would be implemented during road upgrade activities in these areas as directed by the BLM to ensure ground surface stabilization is achieved. Further, all road upgrades in areas of potential flooding (i.e., the eight stream crossings) would be conducted in adherence to Section 9113, Road Standards Manual (BLM 1985, 1991), thereby reducing potential flooding impacts to negligible levels.

Removal of ground cover could result in the reactivation of isolated, stabilized sand dunes along the Crooks Gap Wamsutter Road, which would cause increased soil loss and a decrease in productivity. However, dunal areas would be avoided, where possible, and all necessary disturbances in dunal areas would be stabilized and reclaimed as soon as practical based on site-specific BLM reclamation criteria; therefore, impacts to stabilized dunes are expected to be moderate.

4.1.4.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Impacts to project activities from geologic hazards under Alternative A would occur at the same levels as the Proposed Action (i.e., negligible). Impacts from project activities on geologic hazards, however, would be increased to potentially significant levels with regards to potential reactivation of stabilized sand dunes, since the Alternative A transportation corridor would cross approximately 3.4 miles of stabilized windblown deposits (sand dunes) (see Map 3.2). The new and LOP disturbance acreage in dunal areas would be 41 and 20 acres, respectively. Potential flood impacts would also be increased from the Proposed Action, since one additional stream crossing would be required; however, site-specific stabilization and reclamation measures as mentioned for the Proposed Action would be provided under this alternative. Additional impacts to geologic hazards under this alternative would occur at the same levels as the Proposed Action (i.e., negligible for subsidence, landslides, and abandoned mine fires) and be slightly increased, since 98 more acres would be disturbed initially. However, 46 fewer acres would be disturbed for the LOP.

4.1.4.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Impacts to and from project activities from geologic hazards under Alternative B would occur at the same levels as the Proposed Action (i.e., negligible) but would be increased with regards to potential flood impacts, since one additional stream crossing would be required. Additional impacts to geologic hazards under this alternative would occur at the same levels as the Proposed Action (i.e., negligible for subsidence, landslides, and abandoned mine fires), and be slightly increased since 23 more acres would be disturbed initially. However, 14 fewer acres would be disturbed for the LOP.

4.1.4.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Impacts to and from geologic hazards under Alternative C would occur at the same levels as the Proposed Action (i.e., negligible). In addition, impacts to geologic hazards under this alternative would be slightly increased from the Proposed Action, since one more acre would be disturbed initially. However, 14 fewer acres would be disturbed for the LOP.

4.1.4.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Impacts to project activities from geologic hazards under Alternative D would occur at the same levels but be slightly reduced from those of the Proposed Action (i.e., negligible), since a smaller sediment basin and dam would be required for this alternative and 32 fewer acres would be disturbed at the mine site. A smaller sediment basin and dam at the Jackpot Mine site would reduce potential seismic and flood impacts on these structures. Impacts from project activities on geologic hazards would also occur at the same levels as the Proposed Action (i.e., negligible); however, they would be slightly increased over the LOP from the Proposed Action, since 97 additional acres would be required to accommodate the existing pit at the Big Eagle Mine for mine waste rock disposal.

4.1.4.7 No Action

Under the No Action Alternative, no impacts to or from geologic hazards would occur as a result of the proposed project, since no additional development beyond that occurring under GMMV's License to Explore 179LE would occur. Existing disturbance at the mine site and along the Jackpot Mine Access Road would be reclaimed per License to Explore 179LE guidance, and existing disturbance at the Big Eagle Mine would be reclaimed per permit obligations specified in WDEQ Permit No. 451.

4.1.4.8 Cumulative Impacts

Stabilized sand dunes, landslide areas, and potential flood-prone sites occur throughout the region and cumulative impacts to these areas could be significant without appropriate mitigations. While the amount of existing disturbance in these areas is not known, future development activities would be conducted to avoid disturbance of these features, wherever possible; however, if sand dunes or landslides are activated, or increased flooding occurs as a result of development activities, these would be significant impacts.

Where dunes and landslide areas are disturbed, stringent erosion control methods would be used to maintain site stability, and areas would be revegetated as soon as practical. Flood-prone areas along perennial, intermittent, and ephemeral drainages within the vicinity of the project would also be avoided wherever possible, and any necessary construction in these areas would include erosion control, sedimentation control, and channel restoration and stabilization measures. These mitigation measures are expected to limit cumulative impacts associated with geologic hazards to moderate levels.

The potential for seismic activity is low throughout the region; therefore, impacts from earthquakes would be negligible. There is no known potential for subsidence in the vicinity of the project; therefore, no subsidence impacts are anticipated other than those potentially occurring from the proposed project.

4.1.5 Paleontological Resources

4.1.5.1 Significance Criteria

Impacts to paleontological resources would be considered significant if important fossils are lost or destroyed. Loss or destruction may occur directly during construction and mining, or indirectly due to private collection or vandalism. Significant beneficial impacts would include discovery of important fossils during predisturbance paleontological surveys of proposed transportation corridors.

4.1.5.2 Proposed Action

Prior to construction, a BLM-approved paleontologist would complete a Class I paleontological survey of project-required lands, and based on the results of the Class I survey, the BLM will determine if a Class III survey of proposed disturbance areas will be required (BLM 1993b). Therefore, impacts to paleontological resources would be negligible and minimized for the LOP and beyond. Important paleontological resources would either be avoided or recovered prior to site facilities and road construction. Because rock formations in the area are known to contain fossils, monitoring during construction in certain areas may be required by the BLM to prevent accidental destruction of paleontological resources. If important fossils are discovered during construction, activities that would disturb these fossils would cease until a BLM-approved paleontologist could evaluate the site and appropriate mitigations measures could be implemented.

Indirect impacts to paleontological resources could occur from the loss of important fossil materials due to inadvertent damage from construction, private collection, or vandalism of newly exposed areas. Beneficial impacts could result from the discovery and analysis of paleontological resources during project implementation. Paleontological resources discovered during project construction and operations would be evaluated by a qualified paleontologist as deemed appropriate by the BLM, and significant features would be avoided or recovered prior to continuing project activities.

4.1.5.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Because the same mitigation measures would be used to prevent impacts to paleontological resources under Alternative A as under the Proposed Action, impacts to these resources would be negligible or beneficial. However, the amount of new ground disturbance under this alternative would be increased by 98 acres.

4.1.5.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Because the same mitigation measures would be used to prevent impacts to paleontological resources under Alternative B as under the Proposed Action, impacts to these resources would be negligible or beneficial. However, the amount of new ground disturbance under this alternative would be increased by 23 acres.

4.1.5.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Because the same mitigation measures would be used to prevent impacts to paleontological resources under Alternative C as under the Proposed Action, impacts to these resources would be negligible or beneficial. However, the amount of new ground disturbance under this alternative would be increased by 1 acre.

4.1.5.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Because the same mitigation measures would be used to prevent impacts to paleontological resources under Alternative D as under the Proposed Action, impacts to these resources would be negligible or beneficial. In addition, the amount of new ground disturbance at the mine site under this alternative would be reduced by approximately 32 acres.

4.1.5.7 No Action

No detrimental impacts to paleontological resources would occur under the No Action Alternative. However, the potential for beneficial paleontological discoveries would be lost.

4.1.5.8 Cumulative Impacts

The combined disturbance of the proposed project and other existing and proposed developments in the region could uncover or destroy important fossils. All new development activities on public lands in the area would be subject to stipulations promulgated in BLM guidelines for paleontological surveys and evaluations and paleontologist qualifications (BLM 1993b). Adherence to these guidelines would hold adverse impacts to fossils throughout the region to negligible levels.

4.1.6 Soils

4.1.6.1 Significance Criteria

Impacts to soils would be considered significant if project activities result in the following:

- noncompliance with measures stipulated in the Reclamation Plan (Appendix B);
- excessive down-cutting of rills and/or gullies on project-required lands;
- expansion of head-cuts along drainages affected by project operations;
- reactivation of stabilized sand dunes;
- mobilization of selenium or other potentially hazardous materials in existing soils to the extent that they affect regional plant and animal populations; and/or
- accidental spills of petroleum products or other hazardous materials which are not adequately remediated.
- project activities occurred in variance with procedures specified in Section 2.1.2.8 of this EIS.

4.1.6.2 Proposed Action

Impacts to soils from the Proposed Action are expected to be moderate during construction and for the LOP. New soil disturbance at the mine site would be 35 acres initially and 42 acres for the LOP. New disturbance along project-required roads would be 171 acres initially and 271 acres for the LOP (see Table 2.1). Approximately 23 acres of existing disturbed areas at the Big Eagle Mine site would also be required for the LOP. Total new and LOP soil disturbance required for the Proposed Action would be 229 and 324 acres, respectively (Table 4.3). The entire mine site would be reclaimed following project completion; however, some roads would remain in place per BLM instruction.

Approximately 96 acres of upland soils would be initially disturbed and 135 acres would be disturbed for LOP. Upland soil suitability for proposed project uses ranges from severe to moderate (Table 4.3).

Soils on fan aprons and terraces would have approximately 105 acres initially disturbed, and 151 acres would be disturbed for the LOP. Fan apron and terrace soil suitability for proposed project uses ranges from severe to good (Table 4.3).

Floodplain and toeslope soils would have approximately 28 acres disturbed initially and 38 acres disturbed for the LOP, and suitability of fan apron and terrace soils for proposed project uses ranges from severe to good (Table 4.3).

No disturbance of large areas with dunal soils is anticipated under the Proposed Action; however, some small areas of windblown deposits along the Crooks Gap Wamsutter Road would likely be disturbed during road upgrades. Sensitive soils would be avoided, where possible, during project construction, and special attention would be given to soil disturbance and reclamation problems (e.g., erosion, revegetation) at sensitive sites.

Soils in the project area are moderately to severely erodible, and the amount of soil lost under natural conditions has not been quantified. However, the widespread potential for significant wind and water erosion on area soils indicates that soil losses would increase as a result of the Proposed Action. The amount of this additional soil loss depends on site-specific conditions and the effectiveness of soil stabilization and reclamation measures.

Moderate construction phase and LOP soil impacts would occur during vegetation stripping, topsoil

Table 4.3 Soil Impact Acreages and Suitabilities, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D		
Soil Groups	New	LOP	New	LOP	New	LOP	New	LOP	New	LOP	Suitability
Upland	96	135	127	112	102	120	97	101	93	159	Severe for septic: large stones. Severe to moderate for roads, sediment dam and basin: seepage, large stones, slope, depth to rock. Moderate for buildings, diversions, parking: large stones, slope.
Fan aprons and terraces	105	151	125	110	120	150	111	171	105	150	Severe to moderate for ponds: seepage, large stones, caving. Poor to good for roads: large stones, depth to rock, shrink/swell, slope. Moderate for drainage/diversions: large stones.
Floodplain and toeslopes	28	38	12	38	25	40	20	38	8	79	Severe to slight for ponds: seepage, caving. Poor to good for roads: low strength, frost action, flooding.
Dunes	0	0	41	20	0	0	0	0	0	0	Severe for roads: low strength, erosive.
Total acreage	229	324	305	280	247	310	228	310	206	388	

salvage and stockpiling, cut-and-fill operations, and increased soil exposure. Exposed or stockpiled soils would be subject to accelerated erosion due to increased runoff, decreased infiltration, and greater exposure to wind until effective erosion control measures are implemented. Soil compaction caused by equipment traffic or raindrop impact may result in reduced soil productivity due to loss of soil structure, increased erodibility, and decreased infiltration and water storage capacity. Crusts potentially formed on exposed soils would also inhibit infiltration and productivity, increase runoff, and enhance erosion potential.

Surveys of the Fourth Creek drainage have shown that the anticipated release rate of mine discharge water, 1.05 cubic feet per second, is less than the 2-year, 6-hour flood rate of 1.2 cubic feet per second. Accordingly, it is anticipated that the creek channel would be in equilibrium with the release rate and no additional mine water-induced soil erosion is expected. Similarly, no erosion is anticipated in the drainages that Fourth Creek discharges into, including Jost and Crooks Creeks. Monitoring and mitigation measures as indicated in Section 2.1.2.8 would further reduce the potential for significant erosion-induced impacts in these drainages.

Soils could be contaminated by accidental spills of petroleum products or other hazardous materials (see Section 4.7). Immediate and appropriate cleanup measures at these sites would limit impacts to negligible levels.

Where sensitive soils would be impacted and the potential for soil loss is increased, rigorous erosion control measures would be applied (e.g., use of stabilizers such as tackifiers or netting) to minimize soil loss. Erosion control efforts would be monitored and repeated, if necessary, until erosion is minimized. Soils compacted during construction would be sufficiently ripped and tilled prior to topsoil spreading and reseeding. In addition, project activities would comply with measures identified in a WDEQ-required Stormwater Pollution Prevention Plan (SPPP), thereby limiting these impacts to moderate levels.

4.1.6.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Under Alternative A, soil impacts resulting from mine construction and operation would likely occur at the same levels as the Proposed Action (i.e., moderate). However, fewer acres of soils would be disturbed under this alternative for the LOP due to the construction of a direct transportation corridor between the mine and the Sweetwater Mill. Impacts under Alternative A would disturb 305 acres initially and 280 acres for the LOP (Table 4.3). Impacts to upland, fan apron and terrace, and floodplain and toeslope soils would initially result in 127, 125, and 12 acres of soil disturbance, and 112, 110, and 38 acres for the LOP, respectively. Potential impacts associated with the reactivation of stabilized sand dunes could increase to significant levels under Alternative A, since the proposed transportation corridor would disturb approximately 41 acres of dunal soils initially and 20 acres for the LOP (see Table 4.3). Dunal soils in the project area are severely susceptible to wind erosion, and specialized mitigation measures would be required during construction, operation, and reclamation of these sites. One additional stream crossing would also be required under Alternative A; however, with the application of site-specific stabilization and reclamation measures as identified for the Proposed Action and other specialized measures as deemed appropriate by the BLM, impacts at stream crossings are expected to be moderate for the LOP and beyond. Cumulative land disturbance would be reduced under this alternative since some existing road disturbance in the vicinity of the proposed project would be reclaimed.

4.1.6.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Under Alternative B, soil impacts resulting from mine construction and operation would likely occur at the same levels as the Proposed Action (i.e., moderate). However, fewer acres of soils would be disturbed for the LOP under this alternative due to the construction of a direct transportation corridor between the Big Eagle Haul Road and the Crooks Gap Wamsutter Road. Impacts under Alternative B would disturb 247 acres initially and 310 acres for the LOP (see Table 4.3). Impacts to upland, fan apron and terrace, and floodplain and toeslope soils would initially result in 102, 120, and 25 acres of soil disturbance, and 120, 150, and 40 acres for the LOP, respectively. Potential impacts associated with the reactivation of stabilized sand dunes would occur at the same locations as the Proposed Action. One additional wetland/stream crossing would be required under this alternative. With the implementation of site-specific stabilization and reclamation measures as for the Proposed Action and other specialized measures as deemed appropriate by the BLM, impacts are expected to be moderate for the LOP and beyond.

4.1.6.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Under Alternative C, soil impacts resulting from mine construction and operation would likely occur at the same levels as the Proposed Action (i.e., moderate). However, fewer acres of soils would be disturbed under this alternative due to the construction of a direct transportation corridor between the Crooks Gap Wamsutter Road and the Sweetwater Mill. Impacts under Alternative C would disturb 228 acres initially and 310 acres for the LOP (see Table 4.3). Impacts to upland, fan apron and terrace, and floodplain and toeslope soils would initially result in 97, 111, and 20 acres of soil disturbance, and 101, 171, and 38 acres for the LOP, respectively. Potential impacts associated with the reactivation of stabilized sand dunes and those occurring at stream crossings would be as specified for the Proposed Action. With the implementation of site-specific stabilization and reclamation measures as for the Proposed Action and other specialized measures as deemed appropriate by the BLM, impacts are expected to be moderate for the LOP and beyond.

4.1.6.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, soil impacts resulting from mine construction and operation would likely occur at the same levels as the Proposed Action (i.e., moderate). While additional disturbed areas would be required for the LOP, fewer acres of soils would initially be disturbed due to the disposal of mine waste rock materials at an existing pit at the Big Eagle Mine. Impacts under Alternative D would disturb 206 acres initially and 388 acres for the LOP (see Table 4.3). Impacts to upland, fan apron and terrace, and floodplain and toeslope soils would initially result in 93, 105, and 8 acres of soil disturbance, and 159, 150, and 79 acres for the LOP, respectively. Potential impacts associated with the reactivation of stabilized sand dunes and those occurring at stream crossings would be as specified for the Proposed Action. With the implementation of site-specific stabilization and reclamation measures as for the Proposed Action and other specialized measures as deemed appropriate by the BLM, impacts are expected to be moderate for the LOP and beyond.

4.1.6.7 No Action

No detrimental soil impacts other than those already existing on the area would occur under the No Action Alternative. Existing disturbance at the Jackpot Mine site and along the Jackpot Mine Access Road would be reclaimed per the License to Explore 179LE guidance, and existing disturbed areas at the Big Eagle Mine would be reclaimed under the obligations specified in WDEQ Permit No. 451.

4.1.6.8 Cumulative Impacts

Maximum new soil disturbance from the proposed project would be 305 acres (Alternative A), and maximum LOP soil disturbance would be 388 acres (Alternative D). In addition, increased water availability in Fourth and No Name Creeks would attract livestock to these areas. The increased livestock use of these areas may increase erosion along the creeks. Project-required soil disturbances would account for less than 5.4% of the total known existing soil disturbance within 8 miles of project-required lands (see Table 4.1). Since mitigation measures for soil impacts from the proposed project would be applied as specified for the Proposed Action and alternatives, and future developments in the area would have similar mitigations, cumulative impacts resulting from the proposed project in combination with existing and potential future impacts would likely be moderate.

4.1.7 Surface Water and Groundwater Resources

4.1.7.1 Significance Criteria

Impacts to surface water and groundwater resulting from the proposed project would be considered significant if:

- surface water quality declined such that existing WDEQ surface water-quality classifications (WDEQ 1990) were no longer applicable to potentially affected surface waters;
- surface water baseflow quantities increased to levels that adversely affect streambed equilibrium slopes, resulting in streambed aggradation and/or degradation;
- mine-water discharges occurred in violation of NPDES Permit No. WY-0033952;
- mine operations resulted in acid generation at levels sufficient to negatively affect the surface water biota;
- mine-water drawdowns occurred at levels that adversely affect surface waters and wetlands on and adjacent to Green Mountain;
- failure of the sediment basin or dam occurred;
- groundwater quality in local stock or domestic wells declined such that the waters would no longer be suitable for current uses;
- groundwater quantities were depleted such that local wells would no longer serve their present functions;
- project activities were conducted in violation of procedures specified in the WDEQ-required SPPP; or
- project activities occurred in variance with procedures specified in Section 2.1.2.8 of this EIS.

4.1.7.2 Proposed Action

Surface water. Impacts to surface water quality and quantity from the Proposed Action are expected to be moderate to negligible for the LOP. Potential impacts include increased flow, turbidity, and sedimentation of surface waters due to mine-water discharge; mine dewatering effects on the base flow rates of area streams; and runoff and erosion effects from disturbed areas at the mine site and along project-required roads. Accidental spills of petroleum products or other pollutants also could impact surface water quality (see Section 4.7). No surface water would be used for the proposed project, and thus, no impacts resulting from direct surface water depletions are anticipated. In addition, a detailed surface water monitoring plan is in place such that if surface water impacts are found to occur during project implementation, appropriate mitigation measures would be developed by GMMV in coordination with the WDEQ, BLM, and other appropriate agency personnel (see Section 2.1.2.8).

Approximately 229 acres of new disturbance and 324 acres of LOP disturbance would be required for the Proposed Action (see Table 4.3), and road improvements would occur at eight wetland/stream crossings (see Table 3.12). Erosion control measures would be applied at these and other erosion-prone areas, and would include diversion ditches and terraces, riprap, matting, temporary sediment traps, silt fencing, waterbars, and timely stabilization and revegetation of disturbed areas. Erosion-prone areas (e.g., steep slopes, floodplains, and sand dunes) would be avoided wherever possible, and where these areas must be impacted, construction would occur during late summer, fall, and winter to avoid high-flow periods. Project activities would be conducted as specified in the SPPP.

Proper containment of hazardous materials in appropriately designed storage facilities, and immediate cleanup of areas contaminated by accidental spills would reduce potential hazardous material impacts to negligible levels. GMMV employees would be trained to adequately respond to an accidental spill, and appropriate containment and cleanup equipment would be available at the mine and/or Big Eagle facilities site.

Mine water would be treated to meet NPDES standards prior to release to Fourth Creek, and as a consequence, no water-quality impacts are anticipated. Surveys of the drainage have shown that the anticipated release rate of 1.05 cubic feet per second is less than the 2-year, 6-hour flood rate of 1.2 cubic feet per second for the drainage. Accordingly, it is anticipated that the channel would be in equilibrium with the release rate and no additional mine water-induced erosion is expected. Similarly, no erosion is anticipated in the drainages that Fourth Creek discharges into, including Jost and Crooks Creeks. Monitoring and mitigation measures as indicated in Section 2.1.2.8 would further reduce the potential for significant erosion-induced impacts in these drainages.

The proposed mine operations have a negligible potential for acid generation, due to the small quantities of sulphur known to be present in potential mine waste rock materials and the high ANP:AGP ratio of these materials (see Section 2.1.2.10). Further monitoring of the AGP of mine waste rock materials would be conducted during mine development, and in the event that monitoring reveals a significant potential for acid generation, appropriate mitigation measures, developed by GMMV in consultation with the WDEQ and BLM, would be applied.

The sediment basin and dam would be designed by a Certified Professional Engineer, and built to applicable WDEQ, WSEO, and BLM standards (see Section 2.1.2.9), and all appropriate permits would be obtained prior to construction. Since the basin and dam would be designed and constructed for zero discharge under normal operating conditions and would be built as a permanent landscape feature, impacts due to basin or dam failure are unlikely to occur. In addition, all affected areas associated with the dam and basin would be topsoiled, revegetated, and appropriately reclaimed during project reclamation activities.

Groundwater. Impacts to groundwater quality and quantity from the Proposed Action would likely be negligible to moderate for the LOP, since groundwater quality would not be affected and groundwater depletions resulting from mine dewatering would occur at locations where there are no current groundwater users.

Mine operation activities are not expected to affect groundwater quality. While accidental spills of hazardous materials introducing contaminants into the groundwater system could occur during the LOP, proper containment of these materials in appropriately designed storage facilities and immediate clean-up of areas affected by accidental spills would reduce potential impacts to negligible levels. In addition, GMMV employees would be trained to adequately respond to an accidental spill, and appropriate containment and cleanup equipment would be available at the mine or Big Eagle facilities site.

Groundwater inflow estimates to the proposed Jackpot Mine excavations have been extrapolated from observations made during pumping of the trial declines and data collected at the nearby Sheep Mountain Mine. These data represent the best available long-term, aquifer-response information. The maximum estimated inflows to the proposed declines likely would total 282 gpm and maximum inflows to the workings likely would be 450 gpm for a total maximum estimated excavation inflow of 732 gpm; however, the heterogeneity of the strata through which the proposed declines would be driven and mining would occur, limits definitive specification of mine-water inflow rates. Additionally, monitoring and mitigation measures are designed to identify variances from estimated groundwater impacts resulting from increased groundwater inflows and other sources. Mitigation measures would be applied as specified in Section 2.1.2.8, thereby limiting potential impacts to moderate levels.

Inflows to the mine are ultimately controlled and limited by the lowest permeability within the surrounding sediments. When the higher permeability saturated lenses are penetrated by a well or excavation, they rapidly release water to the opening and desaturate. Initially, the lenses of higher permeability material would be partially drained or desaturated. Additional groundwater discharge from the lenses of higher permeability would depend upon the groundwater flow through the lower permeability materials into the higher permeability materials. It has been estimated that during 22 years of mining, with only a 2.5% specific yield, mine inflow effects would be limited to a zone which would extend to no more than 850 feet above the planned excavations. This zone would be entirely within the Battle Spring Formation and would be below the major mudstone aquitard layers which have been identified from geophysical logs; therefore, no discernible impact is expected to occur on the aquifers above the aquitard layers, and the inflow seepage is unlikely to lead to the development of a cone of depression.

The mine design requires the construction of stable support pillars during mining. It is anticipated that following mining there could be localized caving above the openings to a maximum height of 100 feet. However, this caving should not cause cross-flow or communication between aquifers.

The perched aquifer systems of the Crooks Gap Conglomerate, which are the source to the springs and seeps on the mountain flanks, are primarily located above 7,600 feet elevation and are hydraulically separate from the water-bearing strata adjacent to and above the ore zones to be mined. Investigation wells have confirmed that these upper aquifers are, in fact, perched, and are in many cases separated by nonwater-bearing zones; therefore, they would only be locally affected by the proposed mining operation in the vicinity of the portal locations. In addition, during abandonment operations the Crooks Gap Conglomerate would be isolated from other penetrated strata.

The upper 20% of the declines would penetrate the Crooks Gap Conglomerate. Based on measured inflow rates to the trial declines, groundwater inflow from the Crooks Gap Conglomerate would total 57 gpm. Because this groundwater inflow would be entirely from local water-bearing zones adjacent to the declines, only East Sand Spring Draw, No Name Creek, and Fourth Creek could be influenced (see Map 1.2). East Sand Spring Draw is probably too far removed to be impacted. Fourth Creek is to be used for future mine-water discharge, and consequently, any depletion in Fourth Creek would be more than compensated. If all of this water were to be from the groundwater systems that feed No Name Creek alone (the nearest drainage), its spring flow could be reduced by a maximum of 17%. However, there are very limited wetland habitats in this drainage, and monitoring and modelling to date indicate that such an impact is unlikely to occur. If the effects are uniformly distributed between the three drainages, then the spring flow reduction to these drainages would be 1.6%, at a maximum. Further monitoring and mitigation measures would be applied as identified in Section 2.1.2.8.

Below 7,600 feet elevation, drainage from the Battle Spring Formation would enter subsurface mining areas. There are several major aquitards and many minor ones which separate the mine's ore zones from the groundwater systems above. These layers would limit the effects of mine drainage on the groundwater systems of Green Mountain.

It is estimated that inflows to the decline and workings below an elevation of 7,600 feet would average 413 gpm. Inflow to the workings would impart a very limited partial desaturation of zones located entirely within the Battle Spring Formation. Throughout the desaturation/

resaturation process, no surface effects are anticipated. The water which would be drained from storage in the strata about the underground workings would be replenished slowly by drainage from above, without impacting any of the upper aquifer systems and without impacting the springs and seeps emerging on the mountain flanks. Further monitoring and mitigation measures as specified in Section 2.1.2.8 would be applied to minimize potential groundwater impacts to negligible levels.

4.1.7.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Under Alternative A, potential mine construction and operation impacts to surface water and groundwater resources are expected to occur at the same levels as the Proposed Action (i.e., negligible to moderate). A negligible increase in surface water quality impacts would occur under this alternative, since one additional wetland/stream crossing would be required along the new transportation corridor between the mine site and the Sweetwater Mill and the new corridor crosses an area having numerous stabilized sand dunes which are generally highly erosive and difficult to reclaim. However, mitigation measures as for the Proposed Action would be applied such that surface water impacts would remain consistent with those of the Proposed Action. Approximately 305 acres of new disturbance and 280 acres of LOP disturbance would be required for Alternative A (see Table 4.3).

4.1.7.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Under Alternative B, potential mine construction and operation impacts to surface water and groundwater resources are expected to occur at the same levels as the Proposed Action (i.e., negligible to moderate). A negligible increase in surface water quality impacts would occur under this alternative since one additional wetland/stream crossing would be required along the new transportation corridor between the Big Eagle Haul Road and the Crooks Gap Wamsutter Road; however, mitigation measures as identified for the Proposed Action would be applied such that surface water impacts would remain consistent with those of the Proposed Action. Approximately 247 acres of new disturbance and 310 acres of LOP disturbance would be required for Alternative B (see Table 4.3).

4.1.7.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Under Alternative C, potential mine construction and operation impacts to surface water and groundwater resources are expected to occur at the same levels as the Proposed Action (i.e., negligible to moderate). Mitigation measures as identified for the Proposed Action would be applied under this alternative. In addition, a smaller disturbance area would be required for implementation of this alternative; approximately 228 acres of new disturbance and 310 acres of LOP disturbance would be required for Alternative C (see Table 4.3).

4.1.7.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, potential mine construction and operation impacts to surface water and groundwater resources are expected to occur at the same levels as the Proposed Action (i.e., negligible to moderate). A negligible decrease in surface water quality impacts would likely occur under this alternative, since mine waste rock materials would be disposed of at an existing pit at the Big Eagle mine rather than at the proposed mine site. This action would require less new disturbance in the No Name Creek drainage. While the initial disturbance area required for Alternative D (206 acres) would be reduced from that of the Proposed Action, the LOP disturbance acreage (388 acres) would be increased, since existing disturbed areas at the Big Eagle Mine would be used (see Table 4.3). Mitigation measures as identified for the Proposed Action would be applied under this alternative.

4.1.7.7 No Action

No impacts to surface water or groundwater resources beyond those already present on the area would occur under the No Action Alternative, since no further lands would be disturbed and no further dewatering activities would take place. Existing surface disturbances at the proposed mine site would be reclaimed by GMMV per License to Explore 179LE specifications, and disturbances at the Big Eagle Mine would be reclaimed under the obligations of existing WDEQ Permit No. 451.

4.1.7.8 Cumulative Impacts

Since no surface water is proposed for use during the development of the mine, and mitigation and monitoring measures are in place to ensure surface water quantities are not depleted as a result of potential mine dewatering effects (see Section 2.1.2.8), there would be no cumulative impacts to surface water quantities resulting from the proposed project.

Existing and proposed disturbances within 8 miles of project-required lands total approximately 7,201 acres (see Table 4.1), and most of these disturbances, except perhaps those along unimproved roads, are assumed to have provisions for erosion and sedimentation control. Mine discharge water from dewatering activities and mine-site runoff would be monitored for quality and treated as necessary to meet NPDES criteria prior to release to surface drainages. In addition, erosion and sedimentation control measures would be implemented for this and potential future projects to minimize or alleviate deterioration of water quality. Therefore, cumulative surface water quality impacts are expected to be negligible.

LOP groundwater impacts due to the mining operation are predicted to be negligible, since their are no current users of the waters proposed for dewatering. No known additional development is anticipated in the vicinity of project-required lands, and therefore, no cumulative impacts to groundwater quantity or quality are anticipated. Future development of oil and gas leases in proximity of the mine site could potentially impact groundwater quantity; however, existing BLM and WOGCC well casing and abandonment requirements would limit impacts from these sources to negligible levels. Other groundwater developments in proximity to the mine site would occur at the discretion of groundwater rights owners, which are primarily the BLM and oil and mining companies.

4.1.8 Noise and Odor

4.1.8.1 Significance Criteria

Significant noise impacts would occur if long-term project activities result in exceeding the federal 55 dBA maximum standard for noise at residences and/or other noise-sensitive locations (i.e., sage grouse leks during the breeding season, raptor nests during breeding and nesting seasons, and big game crucial winter range during critical winter periods). Odors produced as a result of the proposed project would be significant if they caused current area land users to utilize locations outside of the area to avoid exposure to these odors.

4.1.8.2 Proposed Action

Perceived sound levels from mining operations are determined by the loudness and pitch of the sound at the source, the proximity of noise sensitive receptors to the source, air temperature, humidity, turbulence, wind gradient, and screening effects from terrain or vegetation. The Proposed Action would likely generate moderate noise impacts from facility and road construction, ore stockpiling, waste rock disposal, ancillary facility operations, vehicle traffic, site rehabilitations, and potential subsurface blasting operations. Since most of the mining activities would occur underground, very little mine-related noise (e.g., development, drilling, blasting, etc.) would be noticeable on the surface. The major sources of noise from the proposed project would be from truck traffic and the mine exhaust fan.

The loudest single location project component would be the mine exhaust fan, which would produce approximately 100 dBA at its source (the proposed mine site) without mitigation. Exhaust fan noise would be reduced by providing a silencer diffuser or sound-absorbing materials which would lower fan noise levels to approximately 75 dBA 20 feet from the source, and since no known noise sensitive locations occur within 1 mile of the mine site, noise impacts at the mine site are expected to be negligible.

Noise from ore-hauling trucks could have an impact on sage grouse leks located along the proposed haul route. To mitigate noise impacts at these sites, GMMV has specified that no project-related ore-hauling activities would occur during the period of one hour before dawn until 9:00 a.m. during the sage grouse breeding season (i.e., March 1 through April 30) (see Item No. 19, Section 2.1.5). This action would hold noise impacts at these locations to moderate levels. No residences occur at locations potentially impacted by project noise.

Increased noise levels associated with equipment employed during the initial facility construction period and road upgrades would constitute short-term, moderate level impacts during construction. Mine operation and access vehicle traffic noise throughout the LOP would constitute a long-term, negligible noise impact.

Odors present periodically along roadways and at the mine site could offend area users in the vicinity of emission sources. Odors associated with mine production operations are neither hazardous nor noxious, and impacts from odors would likely be negligible for the LOP due to wind dispersal. While no mitigations specifically for odor are planned for the Proposed Action, those for air quality (e.g., emission controls) would reduce potential impacts from odors.

4.1.8.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Potential noise and odor impacts associated with project activities under Alternative A would occur as for the Proposed Action (i.e., negligible to moderate for noise, and negligible for odor), and mitigation measures as identified for the Proposed Action would be applied. In addition, since the proposed ore-hauling route (21.7 miles) would be 15.7 miles shorter than that of the Proposed Action, there would be an approximate 42.0% decrease in the potential for noise and odor impacts.

4.1.8.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Potential noise and odor impacts associated with project activities under Alternative B would occur as for the Proposed Action (i.e., negligible to moderate for noise and negligible for odor), and mitigation measures as identified for the Proposed Action would be applied. In addition, since the proposed ore-hauling route (30.9 miles) would be 6.5 miles shorter than that of the Proposed Action, there would be an approximate 17.4% decrease in the potential for noise and odor impacts.

4.1.8.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Potential noise and odor impacts associated with project activities under Alternative C would occur as for the Proposed Action (i.e., negligible to moderate for noise, and negligible for odor), and mitigation measures as identified for the Proposed Action would be applied. In addition, since the proposed ore-hauling route (35.2 miles) would be 2.2 miles shorter than that of the Proposed Action, there would be an approximate 5.9% decrease in the potential for noise and odor impacts under Alternative C.

4.1.8.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Potential noise and odor impacts associated with project activities under Alternative D would occur as for the Proposed Action (i.e., negligible to moderate for noise, and negligible for odor), and mitigation measures as identified for the Proposed Action would be applied. Increased noise and odor impacts would occur in the vicinity of the mine site and at the Big Eagle Mine under implementation of Alternative D due to mine waste rock hauling and disposal activities at these locations; impact levels are expected to remain consistent with those of the Proposed Action.

4.1.8.7 No Action

No impacts to noise or odor beyond existing levels and those potentially occurring as authorized under License to Explore 179LE and the existing Big Eagle Permit (WDEQ Permit No. 451) (e.g., reclamation activities), would occur under the No Action Alternative, since no further development on project-required lands would occur.

4.1.8.8 Cumulative Impacts

The incremental increase in cumulative impacts resulting from past, present, and potential future noises and odors in the vicinity of the proposed project would likely occur at moderate or negligible levels for project-required lands and adjacent areas due to the capacity for wind dispersal of these impacts, the relative paucity of noise sensitive sites, and the application of appropriate mitigation measure. Impacts would be of the same type as those of the Proposed Action and would primarily occur at or near developed locations; however, noise and odor impacts may augment the level of impacts to other resources present in the area (e.g., increased acreage of wildlife disturbance/habitat loss, increased impacts to recreational users).

4.2 BIOLOGICAL RESOURCES

4.2.1 Vegetation

4.2.1.1 Significance Criteria

Impacts to vegetation resulting from the proposed project would be considered significant if:
- a permanent change in land use occurs;
- vegetation productivity is not restored to at least predisturbance levels;
- species composition and diversity change by greater than 50% five years after revegetation;
- excessive weed infestation occurs; and/or
- reclamation plan specifications meeting WDEQ and/or BLM revegetation success criteria are not met.

4.2.1.2 Proposed Action

Removal of vegetation, temporary changes in vegetation types (e.g., shrubland to grassland conversions), weed infestations, and the potential for accelerated erosion constitute both short-term and LOP impacts. Mitigation measures to limit impacts to vegetation include minimization of the size of disturbance areas; use of appropriate erosion and sedimentation controls; implementation of weed control practices as deemed appropriate by the BLM and WDEQ; and prompt revegetation using an appropriate locally adapted seed mixture. With the application of mitigation measures, impacts to vegetation resulting from the Proposed Action are anticipated to be negligible for the LOP.

Although 324 acres of undisturbed lands would be required during the LOP for the Proposed Action, use of existing disturbed areas along upgraded roads would reduce the area of new disturbance to approximately 229 acres (Table 4.4). Only 42 acres of actual vegetation disturbance are anticipated within the 125-acre fenced mine site, of which approximately 7 acres have already been disturbed under License to Explore 179LE. In addition, approximately 23 acres of existing disturbance at the Big Eagle Mine site (i.e., the

Table 4.4 Vegetation Type Disturbance Acreages, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Vegetation Type	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D		Dominant Species
	New	LOP	New	LOP	New	LOP	New	LOP	New	LOP	
Sagebrush-dominated	201	286	252	222	222	270	208	272	198	309	Big sagebrush, silver sagebrush, black sagebrush, needle-and-thread, wheatgrasses, Indian ricegrass
Riparian/ floodplain and toeslope	28	38	12	38	25	40	20	38	8	79	Bluegrasses, wheatgrasses, big sagebrush, greasewood, needlegrasses
Dunal	0	0	41	20	0	0	0	0	0	0	Needle-and-thread, Indian ricegrass, thickspike wheatgrass, silver sagebrush
Total	229	324	305	280	247	310	228	310	206	388	

facilities area) and 277 acres of existing disturbance along existing roads would also be required for the Proposed Action.

New and LOP vegetation disturbance within sagebrush-dominated plant communities at the mine site and along project-required roads (i.e., upland, fan apron, and terrace areas) would be approximately 201 and 286 acres, respectively (Table 4.4). Riparian/floodplain and toeslope area vegetation disturbance would be approximately 28 acres initially and 38 acres for the LOP. No disturbance of large areas with dunal vegetation is expected under the Proposed Action; however, some small areas of dunal vegetation along the Crooks Gap Wamsutter Road would likely be disturbed during road upgrades. Dunal areas would be avoided, where possible, during road upgrades, and special attention would be given to prompt site stabilization and revegetation at these locations.

Areas scheduled for reclamation at the mine site and along project-required roads would be topsoiled and seeded in accordance with specifications presented in the proposed Reclamation Plan for mine (GMMV 1994) (see Appendix B). Reclamation areas would be seeded with a BLM and WDEQ-approved mixture of plant species in the fall prior to ground freeze-up, or in the spring prior to April 15 if fall seeding is not feasible. Reclamation procedures would comply with the BLM's *Wyoming Policy on Reclamation* (BLM 1990b) and relevant WDEQ policies and procedures. Plant species for use in reclamation are discussed in Section 2.1.2.6 and Appendix B. Appropriate erosion control techniques (e.g., waterbars, mulch) would be employed in erosion-prone areas as needed.

Revegetation may, during some years and at some locations, be inhibited by arid conditions and/or soil limitations. GMMV, under WDEQ and/or BLM supervision, would be responsible for monitoring reclamation success; reclamation success criteria consistent with WDEQ and BLM policies would be attained prior to release of GMMV's bond. In addition, site-specific conditions at each proposed development site would be evaluated, and appropriate measures such as ripping, pitting, windrowing, mulching, and/or reseeding with BLM-approved alternative non-native species would be employed. Increases in abundance of weedy species would be mitigated promptly using appropriate control methods. The primary procedure for preventing weed infestation would be prompt revegetation of disturbed areas with locally adapted desirable plant species. If weed control is necessary, mechanical means (e.g., harrowing, disking) may be used. If chemical control is necessary, prior approval would be obtained from the BLM, and only chemicals approved for the specific application would be used.

4.2.1.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Disturbance of vegetation at the mine site and along mine access roads under Alternative A would be the same as for the Proposed Action (i.e., negligible). Vegetation disturbance initially would result in approximately 76 more acres of disturbance than that for the Proposed Action; 44 fewer acres would disturbed for the LOP (Table 4.4). Total new and LOP vegetation disturbance in sagebrush-dominated areas under Alternative A would be 252 and 222 acres, respectively. In riparian/floodplain and toeslope areas, new and LOP disturbance acreages would be 12 and 38 acres, respectively. Potential impacts associated with the reactivation of stabilized sand dunes would increase under implementation of this alternative, since approximately 41 acres of vegetation on stabilized dunes initially would be disturbed and 20 acres would remain disturbed for the LOP. Specialized, site-specific stabilization and reclamation procedures would be applied where dunal vegetation must be disturbed. In addition, one additional stream crossing would be required under Alternative A. However, since fewer acres of vegetation would be disturbed for the LOP, and mitigation, reclamation, and site-specific soil stabilization in dunal areas as described for the Proposed Action would be applied, impacts to vegetation under Alternative A are expected to occur at the same level as for the Proposed Action. Cumulative land disturbance would be reduced under this alternative since some existing road disturbance in the vicinity of the proposed project would be reclaimed.

4.2.1.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Disturbance of vegetation at the mine site and along mine access roads under Alternative B would be the same as for the Proposed Action and Alternative A (i.e., negligible). Vegetation disturbance would result in approximately 18 more acres of initial disturbance and 14 fewer acres of LOP disturbance than for the Proposed Action (see Table 4.4). Total new and LOP vegetation disturbance in sagebrush-dominated areas under Alternative B would be 222 and 272 acres, respectively; in riparian/floodplain and toeslope areas new and LOP disturbance acreages would be 25 and 40 acres, respectively. Potential impacts associated with the disturbance of vegetation on stabilized sand dunes would be the same as for the Proposed Action. One additional stream crossing would be required under Alternative B. Given that mitigation and reclamation measures would be implemented and fewer acres of vegetation would be disturbed, impacts to vegetation under Alternative B are expected to occur at the same level as for the Proposed Action.

4.2.1.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Disturbance of vegetation at the mine site and along mine access roads under Alternative C would be the same as for the Proposed Action and Alternatives A and B (i.e., negligible). Vegetation disturbance would result in approximately 1 less acre of initial disturbance and 14 fewer acres of LOP disturbance than for the Proposed Action (see Table 4.4). Total new and LOP vegetation disturbance in sagebrush-dominated areas under Alternative C would be 208 and 272 acres, respectively; in riparian/floodplain and toeslope areas new and LOP disturbance acreages would be

20 and 38 acres, respectively. Potential impacts associated with the disturbance of vegetation on stabilized sand dunes and at stream crossings would be the same as for the Proposed Action. Since mitigation and reclamation measures as described for the Proposed Action would be implemented, and fewer acres of vegetation disturbance are required, impacts to vegetation under Alternative C are expected to occur at the same level as for the Proposed Action.

4.2.1.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, the acreage of initial vegetation disturbance would decrease from the 229 acres required for the Proposed Action to 206 acres (198 acres sagebrush and 8 acres riparian/floodplain and toeslope) due to the decreased size of the mine waste rock pile at the mine site; however, LOP disturbance would increase from the 324 acres required for the Proposed Action to 388 acres (198 acres sagebrush and 79 acres riparian/floodplain and toeslope) due to the inclusion of the area occupied by an existing pit at the Big Eagle Mine. Potential impacts associated with the disturbance of vegetation on stabilized sand dunes and at stream crossings would be the same as for the Proposed Action. Since fewer acres of vegetation would be disturbed and mitigation and reclamation measures would be implemented under this alternative as for the Proposed Action, impacts to vegetation under Alternative D are expected to occur at the same level as those for the Proposed Action.

4.2.1.7 No Action

No detrimental impacts to vegetation resources other than those already existing in the area would occur under the No Action Alternative. Existing vegetation disturbance at the Jackpot Mine site and along the access road would be reclaimed by GMMV under the License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of existing permit (WDEQ No. 451).

4.2.1.8 Cumulative Impacts

The maximum extent of new vegetation disturbance resulting from the proposed project would be 305 acres (Alternative A), and maximum LOP vegetation disturbance would be 388 acres (Alternative D). Project-required vegetation disturbance would account for less than 5.4% of the total known existing vegetation disturbance within 8 miles of project-required lands (see Table 4.1). Cumulative impacts resulting from the existing, proposed, and potential future actions on and within the vicinity of the proposed project are not expected to be significant due to the following:

- less than 2% of the entire 8-mile area surrounding project-required lands would be disturbed as a result of existing and Proposed Actions;
- mitigation and monitoring measures for vegetation impacts from the proposed project would be applied as specified for the Proposed Action and alternatives; and
- future developments in the area would likely have mitigation and monitoring measures similar to those of the Proposed Action and alternatives.

The primary measure for reducing cumulative impacts would be successful revegetation with adapted native plant species. Since it is assumed that successful revegetation would be accomplished, and postdevelopment land use, productivity, plant species diversity, ground cover, wildlife habitat, and weed control goals would be achieved, cumulative impacts would likely be negligible.

4.2.2 Wetlands and Riparian Areas

4.2.2.1 Significance Criteria

Impacts to wetlands and riparian areas would be considered significant if project activities resulted in a violation of Section 404 of the Clean Water Act or Executive Order 11990. Section 404 governs the placement of dredged or fill material in waters of the U.S. (including wetlands), and Executive Order 11990 mandates no net loss of wetlands. Impacts would also be considered significant if procedures specified for the protection of wetland/riparian habitats as presented in Section 2.1.2.8 and in GMMV (1994) are not followed.

4.2.2.2 Proposed Action

Where possible, surface-disturbing activities at or in the vicinity of wetland/riparian sites would be avoided. Since wetland monitoring measures would be conducted as a component of the Proposed Action (see Section 2.1.2.8), negligible adverse impacts to wetlands are anticipated. No water drawdown effects on stream base flows are anticipated. Nevertheless GMMV proposes to develop a program to enhance 20 acres of wetlands on Green Mountain and if implemented these enhancement measures could result in a net beneficial impact to the area, given the minimal amount of wetland/riparian site disturbance anticipated from project activities.

Under the Proposed Action, a total of 6.4 acres in 12 wetland/riparian areas would be disturbed--4.0 acres at the mine site, 1.2 acres along access roads, and 1.2 acres along the ore-hauling route (see Table 3.12). Permanent watercourse diversions around the proposed mine site and waste rock storage area would be constructed, stabilized, and vegetated as specified in GMMV (1994); it is anticipated that these areas would, upon establishment of riparian plant species, serve as replacement riparian habitat for the 4.0 acres disturbed at the mine site. Road upgrades would likely include culvert and bridge replacement, as necessary, at existing crossings, and construction operations would conform with BLM road standards (BLM 1985, 1991). Riparian areas disturbed during road construction would be permanently revegetated with riparian species to stabilize streambanks. Temporary channel stabilization techniques (e.g., riprap) and diversions would be used, if necessary, to minimize erosion and sedimentation during construction.

Further mitigation measures would be developed in coordination with the WDEQ, COE, BLM, and WGFD as deemed appropriate, based on monitoring results. Where rehabilitation of wetland areas is required, the initial primary objective would be soil stabilization with native species. The desired plant species composition after rehabilitation would depend on site-specific objectives.

4.2.2.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Under Alternative A, impacts to wetland/riparian areas at the mine site and along project-required roads would be the same as for the Proposed Action (i.e., negligible). However, one additional wetland crossing for a total disturbance of 6.7 acres in wetland/riparian areas would be required (see Table 3.12). Mitigation and monitoring measures would be applied under Alternative A as for the Proposed Action. Stream crossings along the new transportation corridor would be constructed following BLM road construction procedures (BLM 1985, 1991), and additional site-specific stabilization, reclamation, and rehabilitation measures would be applied as directed by the BLM to minimize erosion and sedimentation impacts.

4.2.2.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Under Alternative B, impacts to wetland/riparian areas at the mine site and along project-required roads would be the same as for the Proposed Action (i.e., negligible). However, one additional wetland crossing would be required for a total additional disturbance of 6.7 acres in wetland/riparian areas. Mitigation and monitoring measures would be applied under Alternative B as for the Proposed Action. Stream crossings along the new transportation corridor would be constructed following BLM road construction procedures (BLM 1985, 1991), and additional site-specific stabilization, reclamation, and rehabilitation measures would be applied as directed by the BLM to minimize erosion and sedimentation impacts.

4.2.2.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Under Alternative C, impacts to wetland/riparian areas at the mine site, and along project-required roads would be the same as for the Proposed Action (i.e., negligible). No wetland/riparian areas occur along the new transportation corridor; therefore, total disturbance in these areas would be the same as for the Proposed Action (6.4 acres). Mitigation and monitoring measures would be applied under Alternative C as for the Proposed Action.

4.2.2.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, the area of wetland/riparian habitat disturbance at the proposed mine site would be reduced from the 4.0 acres required for the Proposed Action to 3.4 acres, and impacts along project-required roads would be the same as the Proposed Action (i.e., 2.4 acres). Total disturbance of wetland/riparian habitat under the alternative would be 5.9 acres. Since there would be a reduction in the acreage of wetland/riparian habitat disturbance under this alternative, and mitigation and monitoring measures would be applied as for the Proposed Action, potential impacts to wetland/riparian areas are expected to be reduced and remain at negligible levels.

4.2.2.7 No Action

No detrimental impacts to wetland/riparian habitats other than those already existing in the area would occur under the No Action Alternative. Existing disturbance of these areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing wetland/riparian area disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451. No beneficial impacts resulting from the potential enhancement of 20 acres of riparian/wetland habitats (see Section 2.1.3) would occur under the No Action Alternative.

4.2.2.8 Cumulative Impacts

Since the proposed project would not result in a net loss of wetlands, cumulative impacts to wetland/riparian areas resulting from the proposed project in combination with existing and potential future actions in the region are expected to be negligible. Some increased livestock use of riparian/wetland areas along Fourth and No Name Creeks would likely occur as a result of increased water availability in these drainages. Future development activities in the region would comply with Section 404 of the Clean Water Act and Executive Order 11990 as applicable, and similar avoidance and mitigation measures as described for the Proposed Action would likely be applied during these potential developments.

4.2.3 Wildlife and Fisheries

Impacts to wildlife and fisheries resources from mine construction and operation activities would generally be through loss of habitat and disruption of activities due to increased human presence. The direct impact of habitat loss resulting from project construction is quantifiable and the significance of this loss to wildlife resources on project-required lands can be estimated. However, to quantify the effects of such influences as noise, visual disturbance, and human activity on wildlife behavior and habitat use is difficult. Literature pertaining to impacts on wildlife resources from oil and gas development, surface mining, roads, fences, human activity, and other sources of disturbance provided the means to describe a range of potential effects to wildlife due to the proposed project. Impacts to wildlife would continue throughout the LOP as a result of disturbance due to increased human activities; most specifically, increased vehicular traffic. With adherence to wildlife protection measures identified in this EIS, impacts to wildlife and fisheries would likely occur at negligible to moderate levels during construction and for the LOP.

4.2.3.1 Big Game

Significance Criteria. Impacts to big game and other mammals would be considered significant if project-related activities resulted in:

- a loss of greater than 1% of the existing crucial big game habitat (i.e., crucial winter range and parturition areas) for a herd unit (BLM 1994, 1995);
- nonattainment of WGFD big game population objectives; or
- a 5% or greater increase in annual direct mortality (e.g., roadkills, poaching) of any big game species in the project area.

There is a lack of definitive research regarding the level of disturbance within big game crucial habitat (e.g., crucial range) that constitutes a significant impact to big game populations. As a result, regulatory agencies operate under different guidelines pertaining to the amount and type of disturbance allowed within big game crucial range. In the opinion of the WGFD, all crucial big game habitat is vital to sustain communities, populations, or subpopulations of big game animals (WGFD 1994). As part of their mitigation policy, the WGFD is directed by the Wyoming Game and Fish Commission "to *recommend* no loss of habitat function within crucial habitat" (WGFD 1994). Habitat function is defined as "the arrangement of habitat features, and the capability of those features, to sustain species, populations, and diversity of wildlife over time" (WGFD 1994). Although some modification of habitat characteristics may occur due to proposed developments, the habitat function of crucial range must be maintained (i.e., the location, essential features, and species supported must remain unchanged).

The amount of crucial habitat removed within a given herd unit by development activities is a quantifiable measurement of impacts to habitat function. The BLM has determined that project-related disturbance of up to 1% of the crucial range of a big game herd unit is unlikely to significantly impact the habitat function of such range, and has incorporated this standard into recent EISs for proposed projects within Wyoming (BLM 1994, 1995). Displacement of big game from areas adjacent to the project due to visual and noise characteristics of the proposed project may also impact habitat function; the potential extent of this impact, based on published research, is described below.

Proposed Action. No crucial winter range or parturition areas for big game animals would be disturbed as a result of the Proposed Action, and these areas do not occur within 0.5 mile of project-required lands. Project activities are expected to have moderate impacts to big game animals due to the following: mitigation/ reclamation measures designed to restore vegetation on disturbed areas to pre-project conditions would occur during and after completion of operations; no road fencing would be used; and vehicle travel along project-required roads would be conducted in such a manner as to reduce the potential for wildlife-vehicle collisions and displacement.

The mine site and project-required roads are within the 51,776 acres of spring-summer-fall range for the Green Mountain Elk Herd. New and LOP surface disturbance within this range would be 117 and 212 acres, respectively (Table 4.5). Therefore, mine-related surface disturbance would be less than 1% of occupied spring-summer-fall range for the herd. Overall, surface disturbance is expected to have a negligible impact on elk.

Proposed construction and operation activities of the Jackpot Mine project would likely have a moderate impact on elk use of areas adjacent to project-required lands due to displacement. In western Wyoming, elk abandoned ranges in which oil and gas drilling and production activities occurred (Johnson and Lockman 1980, Johnson and Wollrab n.d.). Hayden-Wing Associates (1990) noted that elk in western Wyoming moved away from areas where oil field construction and drilling activities were occurring, but moved back

Table 4.5 Acreage of New and LOP Surface Disturbance within Big Game Ranges, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Species Herd Range Type[2]	Total Occupied Area[3]	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
		New	LOP	New	LOP	New	LOP	New	LOP	New	LOP
Elk											
Green Mountain Herd	85,504										
SSF	51,776	117	212	180	222	126	210	125	213	117	314
Mule Deer											
Sweetwater Herd	496,320										
WYL	137,792	66	121	115	135	72	121	67	121	66	189
SSF	118,208	73	130	100	123	85	124	75	130	73	162
YRL	193,216	6	10	0	5	0	5	6	10	6	10
Pronghorn											
Sweetwater Herd	1,017,728										
SSF	374,336	14	17	0	0	0	0	14	16	14	17
Red Desert Herd	2,151,040										
SSF	1,210,112	233	353	352	349	265	354	231	350	233	449
WYL	714,944	42	48	35	23	47	50	45	38	42	49
Moose											
Lander Herd	702,335										
SSF	424,576	131	254	180	247	149	250	135	254	131	355

[1] Based on 1992 herd unit data (WGFD 1993a).

[2] SSF = spring, summer, fall range; WYL = winter/yearlong range; YRL = yearlong range.

[3] Adapted from WGFD (1993a).

again once intensive disturbance ceased. Although elk adjacent to project-required lands may habituate somewhat to operations at the mine site, it is likely that ore-hauling activities would continue to displace elk for the LOP.

The Proposed Action would result in surface disturbance within spring-summer-fall range (73 acres new, 130 acres LOP), winter/yearlong range (66 acres new, 121 acres LOP), and yearlong range (6 acres new, 10 acres LOP) for the Sweetwater Mule Deer Herd. However, since disturbance within each range type would be less than 1% and there would be no disturbance of crucial ranges, impacts to mule deer resulting from surface disturbance are expected to be negligible.

It is possible that mule deer occupying areas adjacent to project-required lands would adapt to project operations. Mule deer frequented areas in and near oil fields in central Wyoming, and appeared to be less sensitive to human-caused disturbances than pronghorn (Easterly et al. n.d.). Irby et al. (1988) noted that low-level oil and gas development in western Montana had little effect on wintering mule deer; however, high-intensity exploration and production activity could impact populations by making wintering areas unsuitable for mule deer. Mule deer continued to occupy areas immediately adjacent to an operating coal mine in Wyoming (Reed 1981). Mule deer also apparently habituate to the auditory and visual stimuli associated with access roads, and have been observed using areas adjacent to these roads (Reed 1981, Easterly et al. n.d.). It is assumed that moderate impacts to mule deer would result from the displacement of deer from areas adjacent to project-required lands.

New and LOP surface disturbance within spring-summer-fall range for the Sweetwater Pronghorn Herd would be 14 acres and 17 acres, respectively (see Table 4.5); these acreages represent less than 1% of the area of this range type for this herd. Surface disturbance impacts to pronghorn within the Sweetwater Herd under the Proposed Action are expected to be negligible. New and LOP surface disturbance within the Red Desert Pronghorn Herd would be 233 acres and 305 acres, respectively, in spring-summer-fall range and 42 acres and 48 acres, respectively, in winter/yearlong range (see Table 4.5). Since surface disturbance occupies less than 1% of each range type, surface disturbance impacts to the Red Desert Herd are also expected to be negligible.

Pronghorn antelope have exhibited a variety of responses to energy development. In central Wyoming, pronghorn tended to avoid oil fields in which drilling and well maintenance activities occurred (Easterly et al. n.d.). Some animals, however, habituated to human activity and remained near oil fields during and after drilling operations. A portion of a pronghorn population in the Red Desert of Wyoming habituated to activities associated with a uranium mining project and were observed migrating around, under, and over manmade structures used in the operation (Deblinger 1988). Pronghorn does and fawns were commonly observed near the mine pit. Other individuals avoided the mine site and migrated around the area without difficulty.

It is likely that some pronghorn would habituate to mine operations and associated traffic. Easterly et al. (n.d.) noted that pronghorn within sight of an access road did not run in response to traffic going to and from a well pad unless vehicles moved slowly or stopped. To avoid disturbing pronghorn adjacent to project-required roads, GMMV personnel would be instructed not to stop their vehicles between the mine site and the Sweetwater Mill unless absolutely necessary. Some pronghorn likely would not habituate to increased traffic and would stay some distance from the mine site and project-required roads. While it is unknown whether this displacement would adversely affect pronghorn populations, impacts associated with this displacement likely would have a moderate impact on pronghorn.

The mine site and project-required roads occur within the 424,576 acres of spring-summer-fall range for the Lander Moose Herd. New and LOP surface disturbance within this range would be 131 and 254 acres, respectively (see Table 4.5).

Mine-related surface disturbance therefore, would be less than 1% of occupied spring-summer-fall range for the herd, and surface disturbance is expected to have a negligible impact on moose.

Moderate impacts to moose are expected from the Proposed Action due to their displacement from areas adjacent to project-required lands, most notably along the proposed haul route through moose spring-summer-fall range. Rudd (1986) found that while some moose in west-central Wyoming did habituate to roads, 21% of all moose in his study area were displaced and 48% displayed disturbance behavior due to truck traffic. He also suggested that escape ramps be provided during winter along plowed roads. To facilitate moose and other big game movement from plowed roads during the winter, escape ramps along these roads would be provided during project operations.

Increased mortality due to roadkill of big game species is another potential impact. Road upgrades utilizing safe design criteria, enforcement of appropriate speed limits (35 mph), and employee education would limit impacts to big game from vehicle collisions to negligible levels and prevent significant losses of these species.

Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill. The new and LOP surface disturbances under Alternative A are presented in Table 4.5 for each affected big game herd under each range type. Impacts to big game under this alternative are expected to occur at the same levels as for the Proposed Action (i.e., negligible for surface disturbance and moderate for displacement effects). The primary impact to these species is expected to result from displacement, since surface disturbance within affected range types for the various herds never exceeds 1%.

Operation of the Alternative A transportation corridor could potentially increase big game mortality due to vehicle collisions, since animals moving across the area would have to cross two roadways during herd movements. However, the actual distance traveled by project-required vehicles would be reduced, potentially offsetting this effect and reducing potential displacement effects. Cumulative land disturbance would be reduced under this alternative since some existing road disturbance in the vicinity of the proposed project would be reclaimed.

Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road. The new and LOP surface disturbances under Alternative B are presented in Table 4.5 for each affected big game herd under each range type. Impacts to big game under this alternative are expected to occur at the same levels as those of the Proposed Action (i.e., negligible for surface disturbance and moderate for displacement effects).

Operation of the Alternative B transportation corridor could potentially increase big game mortality due to vehicle collisions, since animals moving across the area may have to cross an additional roadway during herd movements. However, the actual distance traveled by project-required vehicles would be reduced, potentially offsetting this effect and reducing potential displacement effects.

Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill. The new and LOP surface disturbances under Alternative C are presented in Table 4.5 for each affected big game herd under each range type. Impacts to big game under this alternative are expected to occur at the same levels as those of the Proposed Action (i.e., negligible for surface disturbance and moderate for displacement effects).

Operation of the Alternative C transportation corridor could potentially increase big game mortality due to vehicle collisions, since animals moving across the area may have to cross an additional roadway during herd movements. However, the actual distance traveled by project-required vehicles would be reduced, potentially offsetting this effect and reducing potential displacement effects.

Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit. The new and LOP surface disturbances under Alternative D are presented in Table 4.5 for each affected big game herd under each range type. Although LOP disturbance would be somewhat higher in most herd units/range types under the alternative, impacts to big game are expected to occur at the same levels as those of the Proposed Action (i.e., negligible for surface disturbance and moderate for displacement effects). Surface disturbance within the various range types for the various herds never exceeds 1%.

Implementation of Alternative D could potentially increase adverse impacts to big game populations due to increased big game-vehicle collisions and displacement effects associated with waste rock hauling activities between the mine site and the Big Eagle pit. However, given the short distance required for this activity (7 miles round trip), the high level of topographic and vegetative screening in the area, employee education regarding safe speed limits (35 mph), and appropriate transportation procedures designed to minimize big game disturbance, displacement impacts under this alternative are expected to remain moderate for big game populations.

No Action. No long-term detrimental impacts to big game species other than those already existing in the area would occur under the No Action Alternative. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451. While being conducted, these reclamation activities could have a negligible impact on big game species.

Cumulative Impacts. Because there are no known projects proposed within 8 miles of project-required lands, no future actions were considered during cumulative impact analyses for big game animals. Existing and proposed surface disturbance within 8 miles of project-required lands in big game ranges are presented in Table 4.6. The proposed project, in combination with existing disturbances in the area, is not expected to significantly impact big game in the region; the proposed project would have no impact on crucial big game ranges, and for most big game ranges, total existing and proposed surface disturbance in these areas would be less than 1%. Only within the 51,776 acre spring-summer-fall range for the Green Mountain Elk Herd would existing and proposed surface disturbance exceed 1% of available range (4.1%).

4.2.3.2 Raptors

Significance Criteria. Impacts to raptors would be considered significant if project-related activities resulted in:

- violation of the Migratory Bird Treaty Act, the Bald Eagle Protection Act, and/or the Endangered Species Act;
- a loss of greater than 5% of either raptor foraging or raptor nesting habitat within the project area; or
- any disruption of raptor breeding activity within the project area that would result in reproductive failure.

Proposed Action. The principal threat to raptors from project activities is disturbance during nesting. Potential conflicts between active nest sites and project-related activities would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that no significant impacts would occur to raptors or their nesting success. A raptor nesting survey of the project area would be conducted prior to and within one year of project construction activities to document the status of raptor nests in the area, and future surveys would be conducted, as needed, to ensure that appropriate mitigation measures (e.g., avoidance) are stipulated. In addition, project construction activities (e.g., road upgrades) would not occur within 0.75 mile of active raptor nests

Table 4.6 Cumulative Surface Disturbance Acreage in Big Game Ranges within Eight Miles of Project-required Lands, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Species Herd Range Type[2]	Total Occupied Area	Disturbance Type		Total Disturbance	Percent of Area Disturbed
		Existing[3]	Proposed Project[4]		
Elk					
Green Mountain Herd	85,504				
SSF	51,776	1,819	314	2,133	4.1%
Mule Deer					
Sweetwater Herd	496,320				
WYL	137,792	649	189	838	0.6%
SSF	118,208	861	162	1,023	0.9%
YRL	193,216	722	10	732	0.4%
Pronghorn					
Sweetwater Herd	1,017,728				
SSF	374,336	1,094	17	1,117	0.3%
Red Desert Herd	2,151,040				
SSF	1,210,112	2,847	449	3,296	0.3%
WYL	714,944	2,253	49	2,302	0.3%
Moose					
Lander Herd	702,335				
SSF	424,576	1,877	355	2,232	0.5%

[1] Based on 1992 herd unit data (WGFD 1993a).

[2] SSF = spring, summer, fall range; WYL = winter/yearlong range; YRL = yearlong range.

[3] Includes all known surface disturbances within 8 miles of project-required lands, including improved and unimproved roads, oil and gas developments, existing mines, the Sweetwater Uranium mill site, and Jeffrey City (see Table 4.1).

[4] Includes all existing and proposed disturbed areas necessary for implementation of the alternative requiring the maximum acreage necessary for the proposed project.

during the nesting season (February 1 through July 31). Annual monitoring of raptor nests on and adjacent to project-required lands would be conducted as deemed appropriate by the BLM and/or WDEQ.

The proposed Jackpot mine site is outside of the 0.75 mile buffer of all known raptor nests in the vicinity of the project. However, new and LOP disturbance amounting to 56 acres and 57 acres, respectively, would occur along project-required roads within the raptor nesting buffers of eight known raptor nests in the area (see Table 4.7). Potential raptor nesting conflicts resulting from road upgrade activities along these roads would be resolved through consultations as described above; therefore, impacts are expected to be negligible.

Reduction in raptor prey species is anticipated to have a negligible effect on raptors in the area, since disturbance (229 acres initially and 324 acres for the LOP [Table 4.7]) would be limited to a small area at the mine site and along existing transportation corridors. Any potential reduction in raptor prey species would be dispersed across the numerous raptor territories known to be present in the area, limiting prey reduction to negligible levels in any one territory.

Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill. Impacts to raptor species under Alternative A are expected to occur at the same level as for the Proposed Action (i.e., negligible). A slight increase in the extent of impacts associated with Alternative A would occur due to the increased acreage of new disturbance required along transportation corridors within raptor nesting buffers (Table 4.7). However, since the transportation corridors would pass through one fewer (7 total) raptor nesting buffer than the Proposed Action, fewer acres would be disturbed within these buffers for the LOP (51 acres). In addition, total LOP disturbance within potential raptor foraging areas would be reduced from that occurring for the Proposed Action. Raptor survey requirements and construction restrictions as described for the Proposed Action would also apply under Alternative A.

Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road. Impacts to raptor species under Alternative B are expected to occur at the same level as for the Proposed Action (i.e., negligible). A slight reduction in the extent of impacts associated with Alternative B would occur due to the decreased new and LOP disturbance within raptor nesting buffers and potential foraging areas (Table 4.7). In addition, the transportation corridors would pass through three fewer (5 total) raptor nesting buffers than for the Proposed Action. Raptor survey requirements and construction restrictions as described for the Proposed Action would also apply under Alternative B.

Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill. Impacts to raptor species under Alternative C are expected to occur at the same level as for the Proposed Action (i.e., negligible). A slight reduction in the extent of impacts associated with Alternative C would occur due to the decreased new and LOP disturbance within raptor nesting buffers and potential foraging areas (Table 4.7). In addition, the transportation corridors would pass through one less (7 total) raptor nesting buffer than for the Proposed Action. Raptor survey requirements and construction restrictions as described for the Proposed Action would also apply under Alternative C.

Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit. Impacts to raptor species under Alternative D are expected to occur at the same level as for the Proposed Action (i.e., negligible). A minor increase in the extent of impacts associated with Alternative D would occur due to the increased LOP disturbance within raptor nesting buffers and in potential foraging areas (Table 4.7). The additional LOP disturbance within raptor nesting buffers would occur only at the existing Big Eagle Mine site; new project-required disturbance in raptor nesting buffers

Table 4.7 Acreage of New and LOP Disturbance within Raptor and Sage Grouse Habitats, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

		Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
Species/Habitat Type	Total Acreage	New	LOP	New	LOP	New	LOP	New	LOP	New	LOP
Raptors											
Foraging Habitat[1]	476,000	229	324	305	280	247	310	228	310	206	388
Nest Buffer[2]	9,048	56	57	82	51	48	43	44	43	56	128
Sage Grouse											
Probable Nesting Area[3]	1,900,000	207	297	275	266	224	293	222	299	207	297
Potential Breeding Area[4]	30,000	3	2	0	0	3	2	3	2	3	2

[1] Assumes all lands within eight miles of the project are suitable raptor foraging habitat.
[2] Includes the entire area within 0.75 mile of the eight known nests potentially affected by this project.
[3] Areas within 2 miles of known lek sites within the Red Desert Upland Game Bird Management Area.
[4] Areas within 0.25 mile of known lek sites within the Red Desert Upland Game Bird Management Area.

would be the same as for the Proposed Action, while new disturbance in potential raptor foraging habitat would be reduced from that of the Proposed Action. The transportation corridors required for the alternative would pass through the same eight raptor nesting buffers as for the Proposed Action. Raptor survey requirements and construction restrictions as for the Proposed Action would also apply under Alternative D.

No Action. No long-term detrimental impacts to raptor species other than those already existing in the area would occur under the No Action Alternative. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451. Reclamation activities at the Big Eagle Mine would occur within a single raptor nesting buffer, although these activities would likely have a negligible impact on raptors utilizing the area.

Cumulative Impacts. All of the 45 known raptor nests occurring within eight miles of project-required lands occur within 0.5 miles of existing disturbed areas (e.g., roads, Sweetwater Mill). Nine of these nests occur on man-made structures. Given the extensive area utilized by raptors and the application of mitigation measures designed to protect raptor nesting activities, cumulative impacts to potential raptor habitat resulting from existing and proposed disturbances in the area likely would be negligible. Surface use stipulations designed to protect active raptor nests from potential disturbances during the breeding season would be applied on all future public land developments on and adjacent to project-required lands, effectively protecting these sensitive sites from future disturbances.

4.2.3.3 Upland Game Birds

Significance Criteria. Impacts to upland game birds (i.e., sage grouse, blue grouse, ruffed grouse, and mourning dove) would be considered significant if project-related activities:

- created a loss of greater than 1% of existing sage grouse probable nesting habitat within the Red Desert Upland Game Bird Management Area;
- resulted in continuous disruption of sage grouse breeding activity on or adjacent to project-required lands; or
- contributed to the decline of upland game bird populations in the area.

Proposed Action. Approximately 1.9 million acres of probable sage grouse nesting habitat (i.e., the area within 2.0 miles of known leks) and 30,000 acres of potential breeding habitat (i.e., the area within 0.25 mile of known leks) occur within the Red Desert Upland Game Bird Management Area (see Table 4.7). Project development activities would occur within areas adjacent to 16 leks, resulting in an initial disturbance of 207 acres of probable nesting habitat and 3 acres of potential breeding habitat. The LOP disturbance would be 297 acres of probable nesting habitat and 2 acres of potential breeding habitat (see Table 4.7). Initial and LOP disturbance within probable nesting habitat and potential breeding habitat would be less than 1% for the Proposed Action. Project-required lands within potential sage grouse breeding habitat occurs exclusively along transportation corridors.

Prior to and within one year of the proposed start of any construction activity, areas designated by the BLM would be surveyed for sage grouse leks, and where possible, no construction activities would be conducted on public lands within 0.25 mile of known active lek sites. Since some leks in the area are located immediately adjacent to project-required roads, birds on these leks could experience some disturbance from increased traffic and collisions with vehicles. To minimize disturbance of breeding sage grouse along these roads, GMMV has indicated that no project-related ore-hauling activities would be conducted during the period from one hour before dawn until 9:00 a.m. during the sage grouse breeding season (i.e., March 1 through April 30). With the implementation of this mitigation measure, impacts to sage grouse are anticipated to be negligible.

Impacts to other upland game bird species are also expected to be negligible, since the amount of disturbance acreage required for the Proposed Action is relatively small compared to the amount of available habitat for these species adjacent to project-required lands. Impacts to these species could potentially occur from increased mortality due to bird-vehicle collisions and possible displacement from project-required and immediately adjacent areas.

Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill. Impacts to upland game bird species under Alternative A are expected to occur at the same level as that of the Proposed Action (i.e., negligible). A slight reduction in the extent of impacts associated with Alternative A would occur due to the absence of project-related disturbance in potential sage grouse breeding areas; the decreased amount of LOP disturbance required in sage grouse probable nesting areas (see Table 4.7); and the decreased LOP disturbance required for the entire project (see Tables 2.1 and 4.4). In addition, the transportation corridors required for the alternative would pass through 11 fewer (5 total) probable sage grouse nesting areas than that for the Proposed Action. Cumulative land disturbance would be reduced under this alternative since some existing road disturbance in the vicinity of the proposed project would be reclaimed. Sage grouse surveys and mitigations as described for the Proposed Action would also apply under Alternative A.

Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road. Impacts to upland game bird species under Alternative B are expected to occur at the same level as that of the Proposed Action (i.e., negligible). A slight reduction in the extent of impacts associated with Alternative B would occur due to the decreased amount of LOP disturbance required in sage grouse probable nesting areas (see Table 4.7) and the decreased LOP disturbance required for the entire project (see Tables 2.1 and 4.4). The transportation corridors required for this alternative would pass through the same sage grouse nesting and breeding areas as the Proposed Action. Sage grouse surveys and mitigations as for the Proposed Action would also apply under Alternative B.

Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill. Impacts to upland game bird species under Alternative C are expected to occur at the same level as that of the Proposed Action (i.e., negligible). A slight increase in the extent of impacts associated with Alternative C would occur due to the increased amount of new and LOP disturbance required in sage grouse probable nesting areas (see Table 4.7). New and LOP surface disturbance required for the entire project would be reduced (see Tables 2.1 and 4.4), and the transportation corridors required for this alternative would pass through the same sage grouse nesting and breeding areas as the Proposed Action. Sage grouse surveys and mitigations as described for the Proposed Action would also apply under Alternative C.

Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit. Impacts to upland game bird species under Alternative D are expected to occur at the same level as for the Proposed Action (i.e., negligible). A slight increase in the extent of impacts associated with Alternative D would occur due to the increased amount of LOP surface disturbance required for the project (see Tables 2.1 and 4.4), as well as potentially increased displacement effects associated with the hauling of mine waste rock materials from the Jackpot Mine site to the Big Eagle pits. New and LOP disturbance in sage grouse nesting and breeding areas would be the same as for the Proposed Action; the transportation corridors required for this alternative would pass through the same sage grouse nesting and breeding areas. Sage grouse surveys and mitigations as for the Proposed Action would also apply under Alternative D.

No Action. No long-term detrimental impacts to upland game bird species other than those already existing in the area would occur under the No Action Alternative. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451. Reclamation activities at the Jackpot Mine site would occur within probable sage grouse nesting areas, but these activities would likely have a negligible impact on sage grouse utilizing the area.

Cumulative Impacts. Less than 0.02% of probable sage grouse nesting habitat within the Red Desert Upland Game Bird Management Area would be directly impacted by new and LOP surface disturbances resulting from the proposed project (see Table 4.7); less than 0.1% of potential breeding habitat in the area would be disturbed. The proposed development would not significantly increase the cumulative impacts to probable sage grouse nesting and breeding areas in the project vicinity. All of the 30 known sage grouse leks occurring within eight miles of project-required lands occur within 0.25 miles of existing disturbed areas (e.g., roads). Given the extensive area utilized by nesting sage grouse coupled with the application of mitigation measures designed to protect sage grouse nesting and breeding activities, cumulative impacts to important sage grouse habitats resulting from existing and proposed disturbances in the area are expected to be negligible. Existing surface use stipulations designed to protect sage grouse leks on public lands would minimize additional undesirable impacts to sage grouse populations potentially affected by future activities in the vicinity of the proposed project.

4.2.3.4 Fisheries

Significance Criteria. Impacts to fisheries would be considered significant if project-related activities resulted in the degradation of any surface water such that it would not support the fish species presently living in the drainage.

Proposed Action. Impacts to fisheries resulting from surface water quality and quantity effects are expected to be negligible during construction, and for the LOP and beyond, since adequate surface water quality and quantity mitigation and monitoring measures would be applied as components of the Proposed Action (see Section 2.1.2.8). Initial construction activities at the mine site and along transportation corridors may degrade water quality due to increased sedimentation and runoff from disturbed areas. A total of 229 and 324 acres of new and LOP disturbance, respectively, would occur under the Proposed Action, and 12 wetland/stream crossings (6.4 acres) would be required. The release of mine water to the Fourth Creek drainage has the potential to introduce contaminants to the drainage, as well as increase erosion and sedimentation in Fourth Creek, Jost Creek, and Crooks Creek downstream from release points. In addition, breech or failure of the sediment dam could adversely impact water quality downstream from the mine site. Impacts to fisheries could also occur from acid rock drainage. However, with the application of mitigation and monitoring measures as described in Sections 2.1.2.8, 2.1.6, and 4.1.7.2, these impacts are expected to occur at negligible levels.

Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill. Under Alternative A, potential mine construction and operation impacts to fisheries are expected to occur at the same level as for the Proposed Action (i.e., negligible). A negligible increase in surface water quality impacts could occur, since one additional wetland/stream crossing area would be impacted along the new transportation corridor (13 total areas impacted); however, mitigation measures as identified for the Proposed Action would be applied. In addition, a smaller disturbance area would be required for the LOP for this alternative (280 acres).

Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road. Under Alternative B, potential mine construction and operation impacts to fisheries are expected to occur at the same level as for the Proposed Action (i.e., negligible). A negligible increase in surface water quality impacts could occur since one additional wetland/stream crossing area would be impacted; however, mitigation measures as identified for the Proposed Action would be applied. In addition, a smaller disturbance area would be required for the LOP for this alternative (310 acres).

Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill. Under Alternative C, potential mine construction and operation impacts to fisheries are expected to occur at the same level as for the Proposed Action (i.e., negligible). A negligible decrease in surface water quality impacts could occur under this alternative since a smaller disturbance area would be required (228 acres of new disturbance and 310 acres of LOP disturbance). The same wetland/stream crossing areas as for the Proposed Action would be impacted under Alternative C. In addition, mitigation and monitoring measures as for the Proposed Action would be applied.

Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit. Under Alternative D, potential mine construction and operation impacts to fisheries are expected to occur at the same level as for the Proposed Action (i.e., negligible). A negligible decrease in surface water quality impacts would likely occur since mine waste rock materials would not be disposed of in the No Name Creek drainage, thereby reducing potential contamination to downstream waters from sediment dam failure and/or acid rock drainage. This alternative would also require less new disturbance at the proposed mine site (206 total acres new disturbance), and a smaller amount of disturbance would be required within wetland/riparian habitats. The LOP disturbance acreage (388 acres) would be increased due to the inclusion of existing disturbed areas at the Big Eagle Mine. Mitigation and monitoring measures as for the Proposed Action would be applied.

No Action. No long-term detrimental impacts to fisheries other than those already existing in the area would occur under the No Action Alternative.

Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451.

Cumulative Impacts. Since no surface water is proposed for use during the development of the mine, and adequate mitigation and monitoring measures are identified to ensure surface water quantities are not depleted and quality is maintained, cumulative impacts resulting from the proposed project in combination with existing impacts in the region are not expected to have a significant impact on area fisheries. In addition, future developments on public lands in the vicinity of the proposed project would also employ proper erosion and sedimentation control and construction techniques, thereby limiting adverse impacts to fisheries to negligible levels.

4.2.3.5 Other Wildlife

Significance Criteria. Impacts to other wildlife species (i.e., small game and nongame mammals, birds, amphibians, and reptiles) potentially impacted by the proposed project would be considered significant if project-related activities resulted in:

- a loss of greater than 2% of existing species-specific habitat within the region; or
- a 5% or greater increase in annual direct mortality (e.g., roadkills, poaching) of any species in the project area.

Proposed Action. While most animal species occurring on and adjacent to project-required lands would be negatively affected by increased human activity in the project area, primary effects would likely occur in direct proportion to the amount of a species' habitat removed. Since new and LOP surface-disturbing activities would occur on only 229 and 324 acres, respectively, (i.e., less than 0.1% of all areas within eight miles of project-required lands), and all of this disturbance would occur on or adjacent to areas of existing disturbance, impacts to most animal species in the region are expected to be negligible. In addition, habitat loss would occur over a relatively large area containing multiple habitat types, thereby reducing the effects of habitat loss on any one species' habitat.

Wetland/riparian and dunal areas are the only rare habitats known to occur in the vicinity of the proposed project, and these areas would be avoided where possible. No large dunal areas would be affected by the Proposed Action, and only 6.4 acres of wetland/riparian habitat (12 locations) would be disturbed. Impacts to wetland/riparian areas would be minimized as specified in Sections 2.1.2.8, 2.1.6, and 4.2.2.2.

An increase in wildlife mortality from collisions with vehicles due to increased traffic along project-required roads is anticipated. However, with the enforcement of appropriate speed limits (i.e., 35 m.p.h) along these roads, impacts are expected to be negligible.

Impacts to other wildlife species at the mine site would include the direct mortality of some animals (primarily burrowing species) due to surface-disturbing activities; potential impacts to species using water detention ponds; and displacement of animals from areas adjacent to the mine site due to high levels of human activity. Potential impacts from these activities are expected to be negligible, since only a relatively small amount of new land disturbance would occur at the mine site (118 acres) (Table 2.1) and sufficient suitable habitats are available on adjacent lands. In addition, if wildlife species (e.g., wading/shorebirds and waterfowl) are attracted to and use any of the water detention ponds at the mine site, appropriate measures to restrict access (e.g., netting, pool covers, additional fencing) would be employed to ensure that impacts to these species are minimized and remain negligible for the LOP. These measures would be monitored for effectiveness by the BLM and, if proven ineffective, further mitigation measures would be applied.

Indirect impacts resulting from increased legal and illegal harvest of wildlife on the area are not expected as a result of the Proposed Action, since no new lands would be opened for public access, and GMMV would educate its employees regarding WGFD rules and regulations for the area. Project personnel would also support WGFD surveillance in the area by immediately reporting all observed illegal harvesting of wildlife on and adjacent to project-required lands. In addition, any project employee caught violating wildlife laws would be disciplined and may be dismissed.

Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill. Under Alternative A, potential direct and indirect impacts to wildlife are expected to occur at the same level as for the Proposed Action (i.e., negligible). While a smaller disturbance area would be required for the LOP under this alternative (280 acres), a minor increase in impacts would likely result from increased disturbance in rare habitats (i.e., wetland/riparian and dunal areas). One additional wetland/stream crossing area would be impacted (13 areas, 6.7 acres impacted), and 41 acres of new disturbance and 20 acres of LOP disturbance would be required in dunal areas. Additionally, the new transportation corridor would allow for greater access to some lands in the area, potentially increasing legal and illegal wildlife harvest. The number of wildlife-vehicle collisions could also increase, since some wide-ranging species may need to cross an additional roadway. However, mitigation measures as for the Proposed Action would be applied, and wildlife impacts are expected to remain consistent with those of the Proposed Action. Site-specific mitigation measures for disturbance within dunal habitats would also be applied under Alternative A. Cumulative land disturbance would be reduced under this alternative since some existing road disturbance in the vicinity of the proposed project would be reclaimed.

Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road. Under Alternative B, potential direct and indirect impacts to wildlife are expected to occur at the same level as for the Proposed Action (i.e., negligible). While a smaller disturbance area would be required for the LOP under this alternative (310 acres), a minor increase in impacts would result from the increased disturbance in wetland/riparian areas. One additional wetland/stream crossing area would be impacted under this alternative (13 areas, 6.7 acres impacted). Additionally, the new transportation corridor would allow for greater access to some lands in the area, potentially increasing legal and illegal wildlife harvest. The number of wildlife-vehicle collisions could also increase, since some wide-ranging species may need to cross an additional roadway. However, mitigation measures as for the Proposed Action would be applied, and wildlife impacts are expected to remain consistent with those of the Proposed Action.

Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill. Under Alternative C, potential direct and indirect impacts to wildlife are expected to occur at the same level as for the Proposed Action (i.e., negligible). A minor decrease in impacts is anticipated due to the smaller disturbance area required for this alternative (i.e., 228 acres of new disturbance and 310 acres of LOP disturbance). Wetland/riparian areas would be impacted as under the Proposed Action (i.e., 12 areas, 6.4 acres impacted). The new transportation corridor would allow for greater access to some lands in the area, potentially increasing legal and illegal wildlife harvest. The number of wildlife-vehicle collisions could also increase, since some wide-ranging species may need to cross an additional roadway. However, mitigation measures as for the Proposed Action would be applied, and wildlife impacts are expected to remain consistent with those of the Proposed Action.

Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit. Under Alternative D, potential direct and indirect impacts to wildlife are expected to occur at the same level as for the

Proposed Action (i.e., negligible). A minor decrease in impacts would likely occur since mine waste rock materials would not be disposed of in the No Name Creek drainage, thereby reducing the amount of new disturbance at the mine site (206 acres total new disturbance). A reduction in the amount of new disturbance within wetland/ riparian habitats at the mine site (i.e., 3.4 acres versus 4.0 acres for the Proposed Action) would also occur. LOP disturbance acreage would increase under Alternative D to 388 acres, since existing disturbed areas at the Big Eagle Mine would be used. Additional traffic would also be necessary to haul mine waste rock materials to Big Eagle pit, potentially increasing vehicle-wildlife collisions and causing displacement of some species from adjacent areas. However, mitigation and monitoring measures as for the Proposed Action would be applied, and wildlife impacts are expected to remain consistent with those of the Proposed Action.

No Action. No long-term detrimental impacts other than those already existing in the area would occur to small game and nongame species under the No Action Alternative. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451. Reclamation activities could have a negligible short-term impact on species occurring on and adjacent to reclamation areas due to direct mortality during earthmoving activities and displacement due to increased human presence.

Cumulative Impacts. Because there are no known projects proposed or scheduled within 8 miles of project-required lands, no future actions were considered during cumulative impact analyses for small game and nongame species. Existing and proposed surface disturbance within 8 miles of project-required lands is presented in Table 4.1. Of the 7,201 acres of known existing and proposed disturbance in the area, the maximum required for the proposed project would be approximately 7% of this total (515 acres), and total disturbance in the area would be less than 2% of all disturbance in the 8-mile area (476,300 acres). Since this disturbance occurs over a wide area and within numerous habitat types, disturbance within any one species' habitat would therefore be reduced. Cumulative impacts resulting from the proposed project in combination with existing disturbances are not expected to be significant.

4.2.4 Wild Horses

4.2.4.1 Significance Criteria

Impacts to wild horses would be considered significant if project-related activities resulted in:

- nonattainment or a permanent reduction (greater than 5%) of wild horse populations below BLM management level objectives;
- a loss of greater than 5% of the existing wild horse range within the Green Mountain or Seven Lakes HMAs; or
- permanent displacement or direct mortality of greater than 5% of all wild horses on and adjacent to project-required lands due to habitat loss or other activities of man.

4.2.4.2 Proposed Action

Loss of forage and intrusion by humans would affect bands of wild horses within the Green Mountain and Seven Lakes HMAs as a result of the proposed project. It is anticipated that wild horses would move at least a short distance away from the mine site and project-required roads throughout the LOP, causing some displacement and disruption to wild horse bands at these sites. This would be a long-term, negligible impact to individual horses at these locations, since large areas of suitable habitat are available on adjacent lands.

Wild horses often become accustomed to vehicular traffic and human presence at minimal levels (BLM 1994), and horses would likely continue to use areas adjacent to project-required lands during mining and ore-hauling operations. However, they would likely avoid locations near the mine site and transportation corridors during periods of constant activity.

Approximately 38 acres of new disturbance and 43 acres of LOP disturbance would be required for the Proposed Action within the Green Mountain HMA, and 251 acres of new disturbance and 375 acres of LOP disturbance would be required within the Seven Lakes HMA (Table 4.8). Following initial reclamation and potential habituation of wild horses to increased activity in the area, it is anticipated that disturbance and displacement effects would have a negligible impact on attainment of wild horse population objectives for the Green Mountain HMA or Seven Lakes HMA.

Although vegetation on much of the area required for the Proposed Action is relatively sparse, range condition is considered to be generally good within the project area. Revegetation would begin as soon as possible after construction of the transportation corridors. Upon project completion, all surface equipment would be removed from the mine site and all disturbed areas at the site would be reclaimed to restore ground cover and forage species. Only a relatively small amount of forage would be lost through initial removal of vegetation, and the temporary conversion of some areas from shrublands to grasslands likely would be beneficial to wild horses; therefore, impacts to wild horses through loss of forage would be negligible.

An increase in horse mortality from collisions with vehicles due to increased traffic along project-required roads could occur as a result of the Proposed Action. However, with the enforcement of appropriate speed limits (i.e., 35 m.p.h) along these roads, impacts are expected to be negligible. GMMV personnel would also be instructed not to harm horses and to minimize disturbance to wild horse bands, especially during known stress periods (i.e., winter, breeding, and foaling seasons).

Water resources on and adjacent to project-required lands would not be depleted or contaminated. Long-term impacts to wild horses are anticipated to be negligible under the Proposed Action.

4.2.4.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Under Alternative A, potential impacts to wild horses within the Green Mountain and Seven Lakes HMAs are expected to occur at the same level as for the Proposed Action (i.e., negligible). While a smaller disturbance area would be required within the Green Mountain HMA (i.e., 24 and 20 acres of new and LOP disturbance, respectively), new disturbance within the Seven Lakes HMA would be increased (363 acres) from the Proposed Action (see Table 4.8). LOP disturbance within the Seven Lakes HMA would also be reduced from the Proposed Action. The new transportation corridor would increase the potential for wild horse-vehicle collisions, since some bands may need to cross an additional roadway during migrations/movements. In addition, this corridor may increase the acreage from which horses would be displaced, since some bands may currently utilize lands adjacent to the new corridor. Mitigation measures as for the Proposed Action would be applied under Alternative A.

4.2.4.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Under Alternative B, potential impacts to wild horses within the Green Mountain and Seven Lakes HMAs are expected to occur at the same level as for the Proposed Action (i.e., negligible). While a smaller disturbance area would be required within the Green Mountain HMA (i.e., 19 and 21 acres of new and LOP disturbance, respectively), new and LOP disturbance within the Seven Lakes HMA would be increased (293 and 383 acres, respectively) from the Proposed Action (see Table 4.8). The new transportation corridor would increase the potential for wild horse-vehicle

Table 4.8 Acreage of New and LOP Disturbance in Potentially Affected Wild Horse Herd Management Areas, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Herd Management Area	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
	New	LOP	New	LOP	New	LOP	New	LOP	New	LOP
Green Mountain	38	43	24	20	19	21	40	43	38	140
Seven Lakes	251	375	363	352	293	383	250	361	251	375

collisions, since some bands may need to cross an additional roadway during migrations/movements. In addition, this corridor may increase the acreage from which horses would be displaced, since some bands may currently utilize lands adjacent to the new corridor. Mitigation measures as for the Proposed Action would be applied under Alternative B.

4.2.4.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Under Alternative C, potential impacts to wild horses within the Green Mountain and Seven Lakes HMAs are expected to occur at the same level as for the Proposed Action (i.e., negligible). Minor increased impacts to wild horses could result from a rise in the number of potential wild horse-vehicle collisions and wild horse displacement from areas adjacent to the new transportation corridor. New and LOP disturbance within the Green Mountain HMA would be similar to that of the Proposed Action, and new and LOP disturbance within the Seven Lakes HMA would be slightly decreased (250 and 361 acres, respectively) from the Proposed Action (see Table 4.8). Mitigation measures as identified for the Proposed Action would be applied under Alternative C.

4.2.4.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Under Alternative D, potential impacts to wild horses within the Green Mountain and Seven Lakes HMAs are expected to occur at the same level as for the Proposed Action (i.e., negligible). Minor increased impacts to wild horses could result from a rise in the number of potential wild horse-vehicle collisions and wild horse displacement from areas adjacent to the mine waste rock haul route. New and LOP disturbance within the Seven Lakes HMA would be identical to that of the Proposed Action, as would new disturbance within the Green Mountain HMA (see Table 4.8). LOP disturbance within the Green Mountain HMA would be greater under Alternative D (140 acres) than for the Proposed Action, since existing disturbed areas at the Big Eagle Mine would be used. Mitigation measures as identified for the Proposed Action would be applied under Alternative D.

4.2.4.7 No Action

No long-term detrimental impacts to wild horses, other than those already existing in the area, would occur under the No Action Alternative. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of existing WDEQ Permit No. 451. Reclamation activities could have a negligible short-term impact on wild horses occurring on and adjacent to reclamation areas due to displacement resulting from increased human presence in these areas.

4.2.4.8 Cumulative Impacts

Approximately 2.2% of wild horse range within the Green Mountain HMA would be disturbed as a result of the proposed project in combination with existing disturbances within 8 miles of project-required lands, and approximately 1.3% of the Seven Lakes HMA would be impacted in the same area (Table 4.9). Given the large amount of undisturbed land in the HMAs adjacent to areas that would be affected by this project, cumulative impacts to wild horses resulting from the proposed project in combination with existing disturbances in the area are expected to be negligible.

4.2.5 Threatened and Endangered/Candidate/ Other Species of Concern

4.2.5.1 Significance Criteria

Impacts to T&E, candidate, and other species of concern would be considered significant if project-related activities resulted in:

- the mortality or permanent displacement of any listed or candidate T&E species;
- the disturbance of designated critical habitat for listed or candidate T&E species; or
- the nonattainment or substantial deceleration of T&E, candidate, or other species of concern recovery programs.

4.2.5.2 Proposed Action

No adverse impacts to T&E species are anticipated from the Proposed Action. Impacts to candidate and other species of concern are anticipated to be negligible.

Bald eagles and peregrine falcons may occasionally use the mine site and transportation corridors for foraging during winter or migrations, but no known nests or roosting areas have been identified within or immediately adjacent to the WDEQ-LQD mine permit area or transportation corridors during various surveys conducted by WGFD and BLM over the past 10 years. Potential bald eagle roosting sites along the Sweetwater River north of project-required lands will not be disturbed by proposed project activities. No adverse impacts to bald eagles or peregrine falcons that potentially hunt on or adjacent to the WDEQ-LQD mine permit area and transportation corridors are expected. In the event that bald eagle nests and/or roosts or peregrine falcon nests are discovered on or adjacent to the WDEQ-LQD mine permit area and transportation corridors, the BLM, USFWS, and WGFD would be consulted, and appropriate mitigation measures would be developed and implemented to ensure that these species are not impacted.

One confirmed black-footed ferret sighting has been recorded near the Big Eagle Haul Road (see Table 3.13), and additional black-footed ferret habitat may exist in white-tailed prairie dog colonies in this and other areas. Prior to construction activities at the mine site and along project-required roads, the size and burrow densities of prairie dog colonies in areas proposed to be disturbed would be determined. If sufficient acreage and densities of prairie dog colonies and burrows are present to constitute potential black-footed ferret habitat, a survey per USFWS guidelines (USFWS 1989) would be made to determine whether ferrets may be present on these areas. In the unlikely event that black-footed ferrets are discovered during surveys, consultation and coordination with the USFWS would be required under Section 7 of the Endangered Species Act to ensure that no adverse impacts to the black-footed ferret would result from the Proposed Action.

Impacts to ferruginous hawk are anticipated to be negligible. Although no potential conflict between active ferruginous hawk nests and proposed project activities is anticipated at present, any that may arise during project implementation would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that no impacts

Table 4.9 Cumulative Surface Disturbance Acreage in Wild Horse Herd Management Areas within Eight Miles of Project-required Lands, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Herd Management Area	Total Occupied Area[1]	Disturbance Type		Total Disturbance	Percent Disturbed
		Existing[2]	Proposed Project[3]		
Green Mountain	117,800	2,433	140	2,573	2.2%
Seven Lakes	358,500	4,253	383	4,636	1.3%

[1] Includes all areas within eight miles of project-required lands.

[2] Includes all known existing disturbed areas within eight miles of project-required lands.

[3] Includes all existing and proposed disturbed areas necessary for implementation of the project alternative requiring the maximum acreage.

would occur to this species. Surveys would be conducted to document the status of ferruginous hawk and other raptor nests so that appropriate protective measures are stipulated prior to construction (see Section 4.2.3.2). In addition, disturbance of potential foraging habitat due to proposed activities would be a negligible impact; this disturbance would represent a small percentage of available foraging habitat and would likely be spread throughout several ferruginous hawk territories such that any one individual would not be adversely impacted.

Loss of potential loggerhead shrike and mountain plover foraging and nesting habitat may occur due to proposed activities; however, due to the scattered and limited nature of habitat disturbance, it is anticipated that these species would not be permanently displaced. Aquatic birds such as the black tern and the white-faced ibis are not likely to be impacted by proposed project activities, since there would be no net loss of wetlands, and disturbed wetland areas would be appropriately reclaimed as soon as practical after disturbance. In addition, preconstruction surveys for these and other candidate and other species of concern potentially occurring on project-required lands would be conducted prior to construction. If candidate species are noted in areas to be disturbed, these locations would be avoided until such time as project construction would not affect these species (e.g., post-nesting). Therefore, impacts to these candidate species are expected to be negligible.

T&E, candidate, and other fish species of concern occurring downstream of the project-required lands within the Platte River system would not be adversely affected by the proposed project since there would be no surface water depletion. These T&E, candidate, and other species would be further protected from adverse impacts through the use of proper erosion and sedimentation control techniques during project development.

Candidate and other plant species of concern within and adjacent to project-required lands (see Table 3.13) are not expected to be impacted by the Proposed Action, since these areas would be surveyed for these species prior to construction operations. If these plant species are found to occur, they would be avoided during construction.

4.2.5.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Since project development activities, including preconstruction surveys, would occur under

Alternative A as for the Proposed Action, no adverse affects to T&E species are anticipated. Impacts to candidate and other plant and animal species of concern are anticipated to be negligible and reduced under this alternative. Less acreage would be disturbed for the LOP (see Tables 2.1 and 4.4), and the same mitigation and monitoring measures as for the Proposed Action would be implemented.

4.2.5.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Since project development activities, including preconstruction surveys, would occur under Alternative B as for the Proposed Action, no adverse affects to T&E species are anticipated. Impacts to candidate and other plant and animal species of concern are anticipated to be negligible and reduced under this alternative. Less acreage would be disturbed for the LOP (see Tables 2.1 and 4.4), and the same mitigation and monitoring measures as for the Proposed Action would be implemented.

4.2.5.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Since project development activities, including preconstruction surveys, would occur under Alternative C as for the Proposed Action, no adverse affects to T&E species are anticipated. Impacts to candidate and other plant and animal species of concern are anticipated to be negligible and reduced under this alternative. Less land would be disturbed under (see Tables 2.1 and 4.4), and the same mitigation and monitoring measures as for the Proposed Action would be implemented.

4.2.5.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Since project development activities, including preconstruction surveys, would occur under Alternative D as for the Proposed Action, no adverse affects to T&E species are anticipated. Impacts to candidate and other plant and animal species of concern are anticipated to be negligible and reduced under this alternative. Less new disturbance would be required (see Tables 2.1 and 4.4), and the same mitigation and monitoring measures as for the Proposed Action would be implemented. The additional LOP disturbance required for Alternative D includes lands already disturbed at the Big Eagle Mine site.

4.2.5.7 No Action

No adverse effects to T&E, candidate, and/or other species of concern, other than those already existing in the area would occur under the No Action Alternative. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of existing WDEQ Permit No. 451. Reclamation activities could have a negligible short-term impact on candidate and other species of concern occurring on and adjacent to reclamation areas through displacement due to increased human presence in these areas.

4.2.5.8 Cumulative Impacts

It is assumed that appropriate monitoring and mitigation measures for T&E, candidate, and other species of concern have been employed throughout regional development projects on public lands on and in the vicinity of the proposed project, and that potential future developments in the area would also apply appropriate mitigation and monitoring measures. Therefore, it is anticipated that there would be no adverse cumulative effects to T&E species and only negligible cumulative impacts to candidate and other species of concern resulting from the proposed project in combination with past and reasonably foreseeable future developments in the area.

4.3 CULTURAL AND HISTORIC RESOURCES

4.3.1 Significance Criteria

Significant impacts to cultural and/or historic resources would occur if project-related activities result in:

- failure to comply with BLM procedures implementing federal cultural resource management practices;
- loss, destruction, or alteration of all or a contributing part of an NRHP eligible cultural or historic resource that is not appropriately mitigated per National Historic Preservation Act and Advisory Council Regulations;
- any surface-disturbing activities within 0.25 mile of contributing segments of historical trails, unless such disturbance is not visible from the trail or occurs within an existing visual intrusion; or
- disturbance of important Native American traditional or cultural sites.

4.3.2 Proposed Action

Direct impacts to cultural and/or historic properties could result from the damage to or destruction of these resources during construction activities at the Jackpot Mine site or along project-required roads; however, these potential impacts would be mitigated following procedures specified in the National Historic Preservation Act (36 CFR 800), such that most direct impacts to significant (i.e., eligible for or listed on the NRHP) prehistoric or historic resources are expected to be moderate and less than significant. File searches and Class III inventories to identify sites have been completed on all lands potentially affected by the Proposed Action (Goss 1993, Hatcher 1993), and resources identified in the Class III surveys have been evaluated for NRHP eligibility; several significant prehistoric sites have been recorded along the Crooks Gap Wamsutter Road. Eligible or listed sites identified in the file search and Class III inventories would be avoided, where possible; however, some of the sites along the Crooks Gap Wamsutter road may be impacted by road construction and/or improvements. If it is determined that any NRHP (eligible or listed) prehistoric sites within proposed disturbance areas cannot be avoided, a data recovery program would be implemented as specified by the BLM and SHPO in adherence to Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800). While no significant impacts to sites along the Crooks Gap Wamsutter Road are anticipated, they could occur if the sites are not properly studied prior to disturbance. Systematic auger testing of some areas prior to road construction, as well as monitoring of construction activities may be conducted as deemed appropriate by the BLM. If historic or prehistoric materials are discovered during construction, all activities within an area defined by the AO would cease immediately, and appropriate BLM personnel would be notified by GMMV to assure proper handling of the discovery by qualified archaeologists. Treatment of sites exposed during construction or monitoring would follow procedures in adherence with Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800), and GMMV would be responsible for mitigation or avoidance of impacts to cultural or historic resources discovered during construction, as deemed appropriate by the BLM, SHPO, and the Advisory Council on Historic Preservation.

A significant prehistoric site, Site 48FR479, has been recorded adjacent to Fourth Creek in Section 18, T27N, R91W (Harrison 1989). This site may be directly impacted by increased water flows in Fourth Creek resulting from mine-water discharge. Throughout the LOP, this site would be monitored by GMMV as deemed appropriate by the BLM, WDEQ, and SHPO, and if it is determined that the site may be impacted, mitigations would be applied following procedures in adherence with Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800). A significant impact to the site could occur if the site is not properly mitigated prior to disturbance.

A NRHP eligible historic trail, the Rawlins-Fort Washakie Stage Road, intersects the proposed haul road in Section 6, T27N, R92W, and follows the Crooks Gap Wamsutter Road north along the proposed transportation corridor. Field inspection of this area by Craig Bromley, LRA Archaeologist, indicated only one segment of the Stage Road retains good physical and/or environmental integrity (personal communication, 1993, with Craig Bromley, archaeologist, BLM). Cultural resource inventories of this site have determined that the historic trail may have sufficient physical and environmental integrity to represent a contributing segment of an historic trail. As such, the contributing segment would be avoided during construction to avoid potential visual impacts and preserve the environmental setting. Impacts to the physical and environmental integrity of the Stage Road would be avoided by utilizing previously disturbed areas and restricting construction activities associated with upgrading the Crooks Gap Wamsutter Road to the opposite (west) side of the road. If avoidance is not feasible, a significant impact to the site could occur; however, a mitigation plan would be implemented, and the plan would address potential effects to the road and could include preconstruction aerial photographic recording, development of a publishable interpretive context, and ROW width reductions.

Indirect impacts to cultural resources, including the unauthorized collection of artifacts, would be moderate and less than significant, since significant sites within and adjacent to disturbance areas would be avoided or mitigated. Potential impacts would be further reduced by informing all field personnel of the importance of the resources and the regulatory obligation to protect such resources. All GMMV personnel employed for the Proposed Action would be instructed that collection of cultural material is prohibited by law.

Initial consultations with Native American groups indicated that no important traditional or cultural sites occur on project-required lands, and further consultations with these groups would be conducted as deemed appropriate by the BLM. If any important traditional or cultural sites are identified, the BLM would review the potential impacts to these sites to determine what measures are necessary to prevent or mitigate significant impacts. No impacts to important Native American traditional or cultural sites are anticipated from the Proposed Action.

4.3.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Impacts to cultural and historic resources under Alternative A would be as for the Proposed Action (i.e., moderate and less than significant for most sites and potentially significant for Site 48FR479 and the Rawlins-Fort Washakie Stage Road). Prior to construction of the new transportation corridor, a Class III cultural resource inventory of all potentially affected areas would be conducted and potential sites on the area would be avoided or mitigated as described for the Proposed Action. The NRHP eligible Rawlins-Fort Washakie Stage Road would be crossed by the Alternative A transportation corridor; however, all efforts would be made to cross the Stage Road within an existing disturbed area and/or outside of a contributing segment of the road. If the road must be impacted, a significant impact could result; however, mitigations as described for the Proposed Action would be applied.

The area of LOP disturbance would be reduced under the Alternative A (see Tables 2.1 and 4.4), thereby reducing the potential for impacts to buried cultural resources during construction. All mitigation measures as described for the Proposed Action would be applied under this alternative, such that impacts to most cultural and historic resources are expected to be moderate.

4.3.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Impacts to cultural and historic resources under Alternative B would be as for the Proposed Action (i.e., moderate and less than significant for most sites and potentially significant for Site 48FR479 and the Rawlins-Fort Washakie Stage Road). Prior to construction of the new transportation corridor, a Class III cultural resource inventory of all potentially affected areas would be conducted and potential sites on the area would be avoided or mitigated as described for the Proposed Action. The NRHP eligible Rawlins-Fort Washakie Stage Road would be crossed by the Alternative B transportation corridor; however, all efforts would be made to cross the Stage Road within an existing disturbed area and/or outside of a contributing segment of the road. If the road must be impacted, a significant impact could result; however, mitigations as described for the Proposed Action would be applied.

The area of LOP disturbance would be reduced under Alternative B (see Tables 2.1 and 4.4), thereby reducing the potential for impacts to buried cultural resources during construction. All mitigation measures as described for the Proposed Action would be applied under this alternative, such that impacts to most cultural and historic resources are expected to be moderate.

4.3.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Impacts to cultural and historic resources under Alternative C would be as described for the Proposed Action (i.e., moderate and less than significant for most sites and potentially significant for Site 48FR479 and the Rawlins-Fort Washakie Stage Road). Prior to construction of the new transportation corridor, a Class III cultural resource inventory of all potentially affected areas would be conducted and potential sites on the area would be avoided or mitigated as described for the Proposed Action. The NRHP eligible Rawlins-Fort Washakie Stage Road would be affected and mitigated as described for the Proposed Action under implementation of this alternative.

The area of new and LOP disturbance would be reduced under the implementation of Alternative C (see Tables 2.1 and 4.4), thereby reducing the potential for impacts to buried cultural resources during construction. All mitigation measures as described for the Proposed Action would be applied under this alternative, such that impacts to most cultural and historic resources are expected to be moderate.

4.3.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Impacts to cultural and historic resources under Alternative D would be as described for the Proposed Action (i.e., moderate and less than significant for most sites and potentially significant for Site 48FR479 and the Rawlins-Fort Washakie Stage Road). The proposed transportation corridor for this alternative is the same as that of the Proposed Action, and the NRHP eligible Rawlins-Fort Washakie Stage Road would be affected and mitigated as described for the Proposed Action.

The area of new disturbance required would be reduced under the implementation of Alternative D (see Table 4.4), thereby reducing the potential for impacts to buried cultural resources during construction. While the LOP disturbance area would be increased under this alternative, the all mitigation measures as described for the Proposed Action would be applied, such that impacts to most cultural and historic resources are expected to be moderate.

4.3.7 No Action

Under the No Action Alternative, no additional impacts to cultural and historic resources beyond currently existing levels would occur, since no additional ground-disturbing activities would be implemented. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of WDEQ Permit No. 451.

4.3.8 Cumulative Impacts

Disturbance and/or loss of unidentified sites or artifacts could add to the cumulative loss of information about our heritage in the project area and throughout the region if these resources are not identified, inventoried, and/or appropriately protected prior to disturbance. However, such losses are not expected to be adverse, except perhaps in the case of the Rawlins-Fort Washakie Stage Road, since mitigation measures as identified for the Proposed Action would be implemented under all proposed and potential future development projects on public lands in the region.

4.4 SOCIOECONOMICS

4.4.1 Significance Criteria

Impacts to socioeconomic features would be considered significant if project-related activities resulted in:

- population growth beyond the capacity of communities to provide adequate housing, schools, and services, or otherwise adapt to growth-related social and economic changes;
- revenue flows and expenditures by local, county, or state governments that are inadequate to maintain public services and facilities at established levels;
- any permanent displacement of residents or users of affected areas; or
- perceived changes in existing ways of life resulting in community discontent sufficient to create organizational response and conflict.

4.4.2 Proposed Action

Socioeconomic impacts resulting from the proposed Jackpot Mine project are expected to be primarily beneficial, resulting from increased job opportunities; increased county, state, and federal tax revenues; and economic growth in local communities. Adverse impacts to socioeconomic resources include potential minor increases in crime and the associated need for increased law enforcement (negligible impacts); and decreased safety along project-required roads (moderate impacts).

It is anticipated that the number of employees working at the proposed Jackpot Mine would range from 25 to 250 per year (Table 4.10). During peak production, (i.e., years 5 through 16), employment is expected to remain stable at approximately 250 workers. Approximately 75% of project personnel (18 to 187 workers) would come from local communities (e.g., Jeffrey City, Lander, Riverton), since over 2,500 unemployed individuals live in Fremont and Carbon Counties (see Section 3.4.1.2). The 25% of employees expected to immigrate into the area likely would be specialists that currently do not reside in the area.

Associated support and service employment generated by the Proposed Action would range from 75 to 750 people per year over a 22-year LOP (Table 4.10). These jobs would include direct service and support workers for the mine (e.g., tool and supply vendors, fuel carriers) as well as indirect service and support workers providing additional infrastructure support for the workers and their families (e.g., general retailers, restauranteers). Few of these jobs are expected to result in immigration to the area, and unemployed workers in Fremont and Carbon Counties would likely fill the majority of these jobs.

Most workers on the Jackpot Mine project likely would live in Jeffrey City, Lander, Riverton, or Rawlins and sufficient housing and community support services are available in these communities to support the limited in-migration that could occur as a result of the project. Extant infrastructures (sewer lines, water lines, streets, electrical service lines, gas lines, telephone service, schools, domestic water systems, recreational facilities, police and fire services) in these communities are also capable of handling potential increased demands associated with the project.

The opening of the proposed Jackpot Mine is expected to have a positive impact on local

Table 4.10 Population Estimates, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Year	Total Employees	Total Associated Population[2]	Expected In-migration[3]	Support and Service Employees[4]
1	30	79	20	90
2	75	197	50	225
3	150	395	99	450
4	200	526	132	600
5	250	658	165	750
6	250	658	165	750
7	250	658	165	750
8	250	658	165	750
9	250	658	165	750
10	250	658	165	750
11	250	658	165	750
12	250	658	165	750
13	250	658	165	750
14	250	658	165	750
15	250	658	165	750
16	250	658	165	750
17	200	526	132	600
18	150	395	99	450
19	125	329	82	375
20	100	263	66	300
21	50	132	33	150
22	25	66	16	75

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[1] Adapted from GMMV (1994).

[2] Total associated population refers to the estimated total number of family members per employee (number of employees x 2.63 [i.e., average number of persons per household for Wyoming]) (USDOC 1990).

[3] Expected in-migration equals 25% of the total associated population.

[4] Support and service employees equals the total number of employees x 3.0.

communities in Fremont and Carbon Counties through an increase in consumption of local goods and services, decreased unemployment, decreased housing vacancy rates, and increased sales tax revenues. Estimated state and local taxes (property, sales and use, and ad valorem taxes) generated as a result of the proposed project are presented in Table 4.11. Over the 22-year LOP, approximately $69 million in tax revenue could be generated.

Potential adverse socioeconomic effects as a result of the Proposed Action are expected to occur at negligible levels. Crime in affected communities may increase, and local sheriff and police departments may need to increase law enforcement efforts. The WGFD may also need to increase enforcement activities in some areas, since improved roads and more people in the area may result in increased poaching.

An increase in travel on access and haul roads may adversely affect traffic safety. Enforcement of speed limits, installation of signs to inform travelers of hazardous situations, and appropriate road improvement design would reduce potential impacts on safety to moderate levels. It is possible that the roads could become safer due to road improvements conducted under the Proposed Action. Roads used frequently by trucks, equipment, and workers would require increased maintenance for the LOP. All roads required for the Proposed Action would be maintained by GMMV, as necessary, to assure safety and prevent degradation of the transportation system. It is anticipated that Fremont and Sweetwater Counties would not incur increased costs for project-required road improvement and maintenance that would not be recovered through taxes paid by GMMV. Resolutions have been obtained from both counties regarding the future use of the Crooks Gap Wamsutter Road.

Upon completion of the proposed project, communities and counties may see some negative impacts as workers are no longer needed and potentially begin to leave the area. However, since the number of workers immigrating into the area would be relatively small, the impacts from workers and their families emigrating from the area are expected to be negligible. General unemployment would also rise following the closure of the mine. This is reflective of the "boom and bust" cycles common to Wyoming. Since the total number of jobs created as a result of the proposed project is relatively small when compared to the total work force in Fremont and Carbon Counties, unemployment is not expected to be impacted significantly.

4.4.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Adverse socioeconomic impacts resulting from Alternative A would generally be the same as for the Proposed Action (i.e., negligible for most impacts and moderate for traffic safety). Impacts to safety along the Crooks Gap Wamsutter Road would be reduced from those of the Proposed Action to negligible levels, since ore-hauling trucks would not utilize this road. No significant adverse socioeconomic impacts are anticipated under this alternative, and beneficial impacts would be the same as for the Proposed Action.

4.4.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Adverse socioeconomic impacts resulting from Alternative B would generally be the same as for the Proposed Action (i.e., negligible for most impacts and moderate for traffic safety). Impacts to safety along the Crooks Gap Wamsutter Road would be slightly reduced from those of the Proposed Action, since ore-hauling trucks would not utilize northern portions of this road. No significant adverse socioeconomic impacts are anticipated under this alternative, and beneficial impacts would be the same as for the Proposed Action.

Table 4.11 Estimated Tax Revenues, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.[1]

Year	Property and Sales and Use Taxes[2] Jackpot Mine	Property and Sales and Use Taxes[2] Support and Service	Ad Valorem Taxes[2]	Total Tax Revenue[3]
1	57,000	78,000	0	135,000
2	142,000	196,000	0	338,000
3	284,000	392,000	1,630,000	2,306,000
4	379,000	523,000	1,630,000	2,532,000
5	474,000	653,000	3,370,000	4,497,000
6	474,000	653,000	3,370,000	4,497,000
7	474,000	653,000	3,370,000	4,497,000
8	474,000	653,000	3,370,000	4,497,000
9	474,000	653,000	3,370,000	4,497,000
10	474,000	653,000	3,370,000	4,497,000
11	474,000	653,000	3,370,000	4,497,000
12	474,000	653,000	3,370,000	4,497,000
13	474,000	653,000	3,370,000	4,497,000
14	474,000	653,000	3,370,000	4,497,000
15	474,000	653,000	3,370,000	4,497,000
16	474,000	653,000	3,370,000	4,497,000
17	379,000	523,000	2,400,000	3,302,000
18	284,000	392,000	1,630,000	2,306,000
19	237,000	327,000	1,000,000	1,564,000
20	189,000	261,000	500,000	950,000
21	95,000	131,000	0	226,000
22	47,000	65,000	0	112,000
			Total	$67,735,000

[1] Adapted from GMMV (1994).

[2] Tax revenues are based on the following:

- Property tax at $910/employee and $418/support services employee.
- Sales and use tax at $984/employee and $453/support services employee.
- Ad valorem tax calculated at 5% of projected production.

[3] Total tax revenue does not include additional property and sales and use taxes on mine-required equipment and materials.

4.4.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Adverse socioeconomic impacts resulting from Alternative C would generally be the same as for the Proposed Action (i.e., negligible for most impacts and moderate for traffic safety). Impacts to safety along the Crooks Gap Wamsutter Road would be slightly reduced from for the Proposed Action, since ore-hauling trucks would not utilize southern portions of this road. No significant adverse socioeconomic impacts are anticipated under this alternative, and beneficial impacts would be the same as for the Proposed Action.

4.4.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Adverse socioeconomic impacts resulting from Alternative D would generally be the same as for the Proposed Action (i.e., negligible for most impacts and moderate for traffic safety). Impacts to safety along the Crooks Gap Wamsutter Road would be the same as for the Proposed Action; however, traffic safety along the Jackpot Mine Access Road and the Anaconda Road would be adversely affected due to the increased use of these roads for mine waste rock transport. No significant adverse socioeconomic impacts are anticipated under this alternative, and beneficial impacts would be the same as for the Proposed Action.

4.4.7 No Action

If the proposed project were not undertaken, uranium reserves in the area would not be developed, and the state, region, and local communities would not benefit from the increased economic activity and income. Many of these communities would remain in a state of economic depression. In addition, no road improvements to the Crooks Gap Wamsutter road would occur under this alternative. Under the No Action Alternative moderate adverse impacts to these communities could result.

4.4.8 Cumulative Impacts

The availability of housing and current regional infrastructures would allow the proposed project, along with other regional developments, to be conducted simultaneously without adversely affecting available resources. Sufficient motel rooms, empty trailer spaces, and vacant housing units are available within commuting distance of the project. Communities in the region have experienced significant population declines in the past and have sufficient existing infrastructures to accommodate proposed and potential future personnel working in the region. The basic character of existing communities would not be changed due to the additional people working on the area. There likely would be an increased demand for law enforcement, including WGFD personnel, due to the increased number of people associated with the project. Increased law enforcement along access roads may be necessary to maintain transportation safety due to increases in traffic volumes.

The cumulative impacts on the local economy, tax base, and revenues due to the project and other potential future projects in the region would be beneficial. The economies of local communities have been depressed due to recent reductions in jobs, populations, and revenues, so stimulation of the economy associated with the payrolls and tax revenues from the project would be beneficial and contribute to offsetting these reductions.

4.5 LAND USE

4.5.1 Significance Criteria

Impacts to land use would be considered significant if project-related activities resulted in:

- a permanent change in land use;
- a greater than 10% permanent reduction in AUMs on any single grazing allotment; or
- a permanent reduction in recreational opportunities within the project area.

4.5.2 Proposed Action

No permanent changes in land use would occur as result of the Proposed Action; all surface equipment and structures would be removed from the area upon project completion, and reclamation would restore disturbed sites to near preproject conditions. The project is in conformance with county, state, and federal land use and management plans. Adverse impacts to most existing land uses (e.g., livestock grazing and recreation) resulting from the Proposed Action are expected to be negligible. A significant impact to oil and gas recovery could occur if lease holders above the mine choose to develop their leases during the LOP.

Mining has historically occurred in the vicinity of the proposed project, however, conversion of affected areas from livestock grazing and wildlife habitat would impart a change in land use in the immediate vicinity of the mine site and along project-required roads. Therefore, the proposed project is expected to temporarily displace or interfere with some historical land uses on a localized basis. Nonetheless, land use changes would be consistent with those already occurring in the area (i.e., along existing roads and at the mine site, which has already been partially developed under License to Explore 179LE).

Approximately 289 acres initially would be required for the Proposed Action, and LOP disturbance would be 418 acres (see Table 2.1). Therefore, approximately 418 acres would be unavailable for most other land uses for the LOP. Only the fenced mine site (125 acres) would be unavailable to the public for the LOP, since public use of project-required roads would be permitted.

Livestock grazing would continue adjacent to project-required lands for the LOP, and grazing may increase along Fourth and No Name Creeks due to increased water availability. There would be some reduction in forage availability (i.e., AUMs lost) due to disturbance and displacement of livestock from project-required areas, and there would be increased potential for livestock-vehicle collisions due to increased traffic. New and LOP AUM losses resulting from the Proposed Action would total 27 and 40 AUMs, respectively, and would be distributed among the three allotments affected by the proposed project (i.e., Cyclone Rim, Green Mountain Common, and Crooks Gap) (Table 4.12). AUM losses in the Cyclone Rim and Green Mountain Common Allotments would be less than 0.1% of those available, and AUM loss in the Crooks Gap Allotment would be approximately 6.0% of that available. The potential for livestock-vehicle collisions would be reduced by utilizing safe road design criteria, enforcement of speed limits, and employee education. Potential short- and long-term impacts to livestock grazing as a result of vehicle collisions and AUM losses are expected to be negligible.

Impacts to wildlife habitats as a result of the Proposed Action are described in detail in Sections 4.2.3 and 4.2.4. No crucial or significant wildlife habitats would be impacted; rare habitats (riparian/wetland and dunal areas) would be avoided, where possible; and only a relatively small amount of available wildlife habitat would be affected. Therefore, only negligible short- and long-term impacts to wildlife habitats are expected from the Proposed Action.

While recreational use of the lands at the proposed Jackpot Mine site (125 acres) would not be permitted for the LOP, recreational use of areas in the vicinity of the mine site are expected to increase during the LOP due to potential increases in the population of the area and road improvements. While the actual amount of increased recreational use in the area cannot be determined, the number of people anticipated to use the area is not expected to exceed the capacity of the resource, nor would the increased use approach the levels that occurred during the late 1970s and early 1980s when several uranium mines were operating in the area and Jeffrey City's population was nearly 2,000. No impacts are expected to the proposed Continental Divide National Scenic Trail System. Following project completion, recreational use of the area is expected to return to premining levels.

Table 4.12 New and LOP AUM Losses, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Allotment	Total AUMs	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
		New	LOP	New	LOP	New	LOP	New	LOP	New	LOP
Cyclone Rim	27,000	4	5	5	3	5	5	5	5	4	5
Green Mountain Common	49,000	20	30	33	33	22	31	21	30	20	39
Crooks Gap	80	3	5	0	2	0	2	3	5	3	5
Total	76,080	27	40	38	38	27	38	29	40	27	49

While reclamation is unlikely to return disturbed lands to their exact premining condition, all reclamation efforts associated with this project are expected to return affected areas to approximate preproject conditions such that they are capable of supporting current land uses in the area. Reclamation is expected to minimize or negate permanent impacts to land uses resulting from the proposed project.

BLM, State of Wyoming, and private lands would all be affected by the Proposed Action (see Map 3.9). The majority of project-required lands are federally owned and administered by the BLM, and 312 and 368 acres of new and LOP disturbance would be required on these lands (Table 4.13). New and LOP disturbance on state lands would be 13 acres, and new and LOP disturbance on private lands would be 23 and 37 acres, respectively.

GMMV has an appropriate mineral claim for the uranium resource beneath the WDEQ-LQD mine permit area, and proposed operations are not expected to infringe on existing lease and ROW holders in the same area. If lease holders in the vicinity of the proposed mine choose to develop leases above the proposed mine during the LOP, proposed mine operations may preclude oil and gas development, and therefore, impart a significant impact to their recovery for the LOP (see Section 4.1.3). Existing power lines and pipelines on and adjacent to project-required lands would be avoided, where possible, and only negligible impacts to ROW operators are expected. The 40 AUMs lost during the LOP may affect grazing privileges, but would not require a reduction in stocking rates in any grazing allotment, so there would be a negligible infringement on the privileges of grazing permittees.

4.5.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Land use impacts resulting under Alternative A generally would be the same as for the Proposed Action, but reduced due to decreased land requirements for the LOP. Adverse impacts due to AUM losses would be decreased from the Proposed Action for the LOP for most allotments; however, three additional AUMs would be lost in the Green Mountain Common Allotment for the LOP (see Table 4.12). Impacts to wildlife habitat under this alternative are described in Sections 4.2.3 and 4.2.4, and impacts to recreation and lease and ROW holders would be the same as for the Proposed Action. Under Alternative A, there would be an increase in the amount of new surface disturbance on federal lands; however, new surface disturbance would be reduced on state and private lands, and LOP surface disturbance would decline on federal, state, and private lands (Table 4.13).

Table 4.13 New and LOP Disturbance Acreage on BLM, State, and Private Lands, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
Ownership	New	LOP	New	LOP	New	LOP	New	LOP	New	LOP
BLM	312	368	359	342	283	366	255	357	312	332
Wyoming	13	13	7	3	20	16	7	7	13	12
Private	23	37	21	27	9	22	28	40	23	171
Total	289	418	387	372	312	404	290	404	289	515

4.5.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Land use impacts resulting under Alternative B generally would be the same as those described for the Proposed Action, but reduced due to decreased land requirements for the LOP. Adverse impacts due to new and LOP AUM loss would be decreased from the Proposed Action for the Crooks Gap Allotment (see Table 4.12). Impacts to wildlife habitat under this alternative are described in Sections 4.2.3 and 4.2.4, and impacts to recreation and lease and ROW holders would be the same as for the Proposed Action. Under Alternative B, there would be a decrease in the amount of new and LOP surface disturbance on federal and private lands and an increase in new and LOP surface disturbance on state lands (see Table 4.13).

4.5.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Land use impacts resulting under Alternative C would generally be the same as those described for the Proposed Action, but reduced due to decreased land requirements. Adverse impacts due to new AUM losses on the Cyclone Rim Allotment would be increased; however, LOP losses would be consistent with those of the Proposed Action on the other affected allotments (see Table 4.12). Impacts to wildlife habitat under this alternative are described in Section 4.2.3 and 4.2.4, and impacts to recreation and lease and ROW holders would be the same as for the Proposed Action. Under Alternative C, there would be an increase in the amount of new and LOP surface disturbance on private lands; however, new and LOP surface disturbance on federal and state lands would be reduced from that of the Proposed Action (see Table 4.13).

4.5.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Land use impacts resulting under Alternative D would generally be the same as those described for the Proposed Action, but increased due to increased land requirements and traffic. Adverse impacts due to LOP AUM losses on the Green Mountain Common Allotment would be increased; however, new AUM losses on all allotments and LOP losses on the Cyclone Rim and Crooks Gap Allotments would be consistent with those of the Proposed Action (see Table 4.12). Impacts to wildlife habitat under this alternative are described in Section 4.2.3 and 4.2.4, and impacts to recreation and lease and ROW holders would be the same as for the Proposed Action. Under

Alternative D, there would be an increase in the amount of LOP surface disturbance on private lands; however, new and LOP surface disturbance on federal and state lands would be consistent with or reduced from that of the Proposed Action (Table 4.13).

4.5.7 No Action

No impacts to land use activities would occur under the No Action Alternative, since no disturbance beyond existing levels would occur. There would be no increase in recreational uses of lands in the area since there would be no increase in the local population. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of existing WDEQ Permit No. 451.

4.5.8 Cumulative Impacts

Since there are no known projects proposed for development in the project area, and past developments in the area are consistent with county, state, and federal land use and management plans, cumulative impacts to land use activities on and in the vicinity of the proposed project would be consistent with those described for the Proposed Action and alternatives. No significant cumulative impacts to land uses are anticipated from past, present, and reasonably foreseeable future activities in the vicinity of the proposed project.

4.6 VISUAL RESOURCES

4.6.1 Significance Criteria

Impacts to visual resources would be considered significant if development activities caused a violation of the BLM VRM objectives specified in the LRA and GDRA RMPs (BLM 1986a:158-162, 1987b:64). Violations would include dominant visual changes in line, form, color, and/or texture on or adjacent to project-required lands in VRM Class III areas as viewed by a casual observer.

4.6.2 Proposed Action

No VRM Class I areas occur on or within visual range of the proposed project. While a VRM Class II area occurs within the WDEQ-LQD Jackpot Mine permit area (see Map 3.10), no disturbance would occur in the area, and new disturbances resulting from the project in areas potentially visible from the Class II area would occur on or adjacent to existing disturbed areas. All project-required lands occur within VRM Class III, IV, and V areas. Impacts to visual resources resulting from the Proposed Action are expected to be negligible, since existing human disturbance on and adjacent to project-required lands has been extensive.

Mining operations at the Jackpot Mine site are not expected to be visible from VRM Class II areas, but some portions of existing roads may be visible. A visual impact would result from the creation of a distinct linear feature visible from VRM Class II areas on Green Mountain. However, this impact would not be significant since numerous linear features (e.g., roads) are visible on the existing landscape, and there would be no change to the VRM Class. Upon completion of road upgrades in these areas, timely revegetation with native species would limit visual resource impacts in Class II areas to current negligible levels.

New and LOP disturbances within VRM Class III, IV, and V areas are listed in Table 4.14. The majority of new and LOP disturbance would occur within VRM Class IV and V areas. Development of the Proposed Action is not anticipated to affect the aesthetic character of VRM areas, since all project activities would occur on or adjacent to existing disturbed areas. Visual resource impacts in VRM Class V areas could affect efforts to rehabilitate or enhance landscape character. However, visual resource impacts are expected to be held to negligible levels by minimizing the amount of disturbance necessary to implement the

Table 4.14 New and LOP Disturbance Acreage within Affected VRM Areas, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

VRM Class	Proposed Action		Alternative A		Alternative B		Alternative C		Alternative D	
	New	LOP	New	LOP	New	LOP	New	LOP	New	LOP
III	37	40	43	26	40	40	38	39	37	40
IV	130	135	166	101	142	127	127	122	130	135
V	122	243	178	245	130	237	125	243	122	340
Total	289	418	387	372	312	404	290	404	289	515

project, appropriate siting of facilities at the mine site (i.e., utilizing existing contours and vegetation screening), and appropriately painting structures at the mine site to blend with the surrounding landscape. In addition, all disturbed areas not required for the LOP (i.e., areas along road easements), would be reclaimed and revegetated as soon as possible. With the application of these mitigation measures, VRM standards for areas on and adjacent to the proposed project should be maintained.

Upon project completion, most visual signs of the project would be removed and most disturbed areas would be reclaimed and revegetated. Permanent impacts to visual resources would be consistent with the management goals for Class III, IV, and V areas.

4.6.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

Impacts to visual resources under Alternative A would increase from the Proposed Action to moderate levels. These increased impacts would result from disturbance along the new transportation corridor in seldom-seen areas, potentially affecting the aesthetic character of the landscape in these areas. However, no significant impacts are anticipated, since developments would occur only in VRM Class III, IV, and V areas, and mitigations would be applied as for the Proposed Action. To further decrease adverse visual resource impacts, all efforts would be made to locate the new transportation corridor in existing disturbed areas. In addition, less LOP disturbance would occur to VRM Class III and IV areas under Alternative A (see Table 4.14).

4.6.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

Impacts to visual resources under Alternative B would increase from the Proposed Action to moderate levels. These increased impacts would result from disturbance along the new transportation corridor in seldom-seen areas, potentially affecting the aesthetic character of the landscape in these areas. However, no significant impacts are anticipated, since developments would occur only in VRM Class III, IV, and V areas, and mitigations would be applied as for the Proposed Action. To further decrease adverse visual resource impacts, all efforts would be made to locate the new transportation corridor in existing disturbed areas. In addition, less LOP disturbance would occur to VRM Class IV and V areas under Alternative B (see Table 4.14).

4.6.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

Impacts to visual resources under Alternative C would remain the same as for the Proposed Action (i.e., negligible). Increased impacts would result from disturbance along the new transportation corridor; however, the entire corridor would be visible from existing roadways, therefore no effects to the aesthetic character of the landscape are anticipated. No significant impacts are anticipated, since developments would occur only in VRM Class III, IV, and V areas, and mitigations would be applied as for the Proposed Action. To further decrease adverse visual resource impacts, all efforts would be made to locate the new transportation corridor in existing disturbed areas. In addition, less new and LOP disturbance would occur to VRM Class IV areas and less LOP disturbance would occur in VRM Class III areas under Alternative C (see Table 4.14).

4.6.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

Impacts to visual resources under Alternative D would remain the same as for the Proposed Action (i.e., negligible). While LOP disturbance would increase under this alternative, due to the use of existing disturbed areas at the Big Eagle Mine, reduced and potentially beneficial impacts are anticipated, since mine waste rock disposal at a pit at the Big Eagle Mine would facilitate reclamation of this disturbed area. The Big Eagle Mine is located in a VRM Class V area. No significant impacts are anticipated, since developments would occur only in VRM Class III, IV, and V areas, and mitigations would be applied as for the Proposed Action. New disturbance under Alternative D would occur at the same levels and at the same locations as for the Proposed Action (see Table 4.14).

4.6.7 No Action

No impacts to visual resources would occur under the No Action Alternative, since no disturbance beyond existing levels would occur. No potential beneficial impacts resulting from mine waste rock disposal at an existing pit at the Big Eagle Mine would be realized. Existing disturbed areas at the Jackpot Mine site and along access roads would be reclaimed by GMMV under arrangements specified in License to Explore 179LE, and existing disturbance at the Big Eagle Mine would be reclaimed under the obligations of existing WDEQ Permit No. 451.

4.6.8 Cumulative Impacts

No significant cumulative visual resource impacts are anticipated from past, present, and reasonably foreseeable future actions in the vicinity of the proposed Jackpot Mine project. There are no known developments, other than the Jackpot Mine project, proposed in the vicinity, and any future developments on public lands in the area would likely adhere to management criteria for development in the various affected VRM Class areas. Existing (within eight miles of the proposed project) and proposed disturbance acreage within the three affected VRM Class areas are shown in Table 4.15, and since this disturbance occupies less than 7.5% of any VRM Class area and VRM objectives would be met, cumulative visual resource impacts are expected to be moderate. Impacts to visual resources resulting from the proposed project in combination with existing disturbances in the VRM Class V area would augment adverse visual resource impacts in the area and potentially affect rehabilitation and enhancement efforts. Nonetheless, reclamation activities at existing mines in the area are currently underway (personal communication with K. Webber, Environmental Coordinator, USE, June, 1993), and the visual characteristics of the area are being improved.

Table 4.15 Cumulative Disturbance Acreage within Affected VRM Areas, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

VRM Class	Total Area[1]	Disturbance Type: Existing[2]	Disturbance Type: Proposed Project[3]	Total Disturbance	Percent Disturbed
III	20,000	1,410	43	1,453	7.3%
IV	270,000	3,156	166	3,322	1.2%
V	50,000	2,120	340	2,460	4.9%

[1] Includes all areas within eight miles of project-required lands.

[2] Includes all known existing disturbed areas within eight miles of project-required lands.

[3] Includes all existing and proposed disturbed areas necessary for implementation of the project alternative requiring the maximum acreage.

4.7 HAZARDOUS MATERIALS

4.7.1 Significance Criteria

Impacts resulting from hazardous materials would be significant if these materials are produced, used, stored, transported, or disposed of in violation of the HMS for the proposed project (see Appendix A), SPCCPs, or the WDEQ-LQD-approved mine permit.

4.7.2 Proposed Action

Impacts to soils, surface and groundwater resources, and wildlife could result from accidental spills, inappropriate water discharges, and/or exposure of these materials to wildlife. Any spills would be cleaned up and contaminated soils disposed of or rehabilitated as specified in the SPCCP. The small amount of soil that potentially could be contaminated, coupled with appropriate and timely cleanup, would result in negligible potential soil impacts from accidental spills. Proper containment of oil, fuel, and other hazardous fluids in appropriately designed and maintained storage facilities and implementation of surface and groundwater mitigation and monitoring procedures (see Section 2.1.2.8), would limit potential surface and groundwater contamination to negligible levels. If wildlife are attracted to and use any of the mine-water treatment ponds and/or monitoring indicates that these ponds contain potentially harmful substances, appropriate measures to restrict access (e.g., netting, pool covers, additional fencing) would be employed to assure that impacts to wildlife are minimized.

Since project operations would comply with all relevant federal and state laws regarding hazardous materials and with directives identified in the HMS and SPCCPs, impacts are anticipated to be negligible.

4.7.3 Alternative A - New Haul Road Between the Jackpot Mine and Sweetwater Mill

The potential for hazardous material impacts under Alternative A would be the same as for the Proposed Action. Since the same mitigation measures would be applied, impacts are anticipated to be negligible.

4.7.4 Alternative B - New Haul Road Between the Big Eagle Road and the Crooks Gap Wamsutter Road

The potential for hazardous material impacts under Alternative B would be the same as for the Proposed Action. Since the same mitigation measures would be applied, impacts are anticipated to be negligible.

4.7.5 Alternative C - New Mill Access/Haul Road Between the Crooks Gap Wamsutter Road and the Sweetwater Mill

The potential for hazardous material impacts under Alternative C would be the same as for the Proposed Action. Since the same mitigation measures would be applied, impacts are anticipated to be negligible.

4.7.6 Alternative D - Mine Waste Rock Disposal at an Existing Big Eagle Pit

The potential for hazardous material impacts under Alternative D (i.e., mine waste rock disposal at an existing pit at the Big Eagle Mine) would be the same as those of the Proposed Action. Since the same mitigation measures would be applied, no significant impacts are anticipated.

4.7.7 No Action

Under the No Action Alternative, there would be no new impacts from hazardous materials, since no additional hazardous materials would be produced, used, stored, transported, or disposed of as a result of the project.

4.7.8 Cumulative Impacts

All existing and potential future actions in the vicinity of the proposed Jackpot Mine project use or would use mitigation measures similar to or more stringent than those described for the proposed project to prevent soil contamination, surface and groundwater pollution, and wildlife exposure. Therefore, cumulative hazardous material impacts are expected to be negligible.

4.8 UNAVOIDABLE ADVERSE IMPACTS

The mitigation and monitoring measures incorporated in the project description (see Sections 2.1.2.8 and 2.1.6), identified throughout the preceding discussion of impacts, and in Chapter 5.0 would avoid or minimize many of the project's potential adverse effects. However, not all adverse effects can be avoided, nor is mitigation 100% effective in remediating all impacts. There would be at least a minimal amount of unavoidable adverse impact on all resources present on and adjacent to project-required lands for at least a short time, due to the presence of equipment and humans in the area and the time necessary for mitigation (e.g., reclamation) to be effective. Potential, significant, unavoidable impacts associated with the project would include:

- fugitive dust emissions along project-required roads;
- the diversion of No Name Creek around the facilities site and mine waste rock pile;
- mine operation preclusion of oil and gas development on areas above the proposed mine;
- reactivation of stabilized sand dunes; and
- degradation of prehistoric Site 48FR479 and/or the Rawlins-Fort Washakie Stage Road.

4.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible and irretrievable impact is defined as a permanent reduction or loss of a resource that, once lost, cannot be regained. The primary irreversible and irretrievable commitment of resources from the proposed project would result from the removal and use of the uranium resource. Other valuable minerals contained within mined materials would also be irreversibly and irretrievably lost. The water produced from the mine during the LOP would eventually be replaced as the aquifers recharge from surface infiltration.

Soil lost through wind and water erosion would be an irreversible and irretrievable loss from project-required lands.

The loss of productivity (i.e., forage, wildlife habitat) from project-required lands would be an irreversible and irretrievable commitment during the time that those lands are out of production and until they are successfully revegetated. Most of the land would be returned to production after reclamation and revegetation; however, vegetation communities may take more than 20 years after the LOP to recover.

Inadvertent or accidental destruction of paleontologic or cultural resources during construction would be an irreversible and irretrievable loss, but since archaeological and paleontological data recovery and monitoring activities would be conducted as deemed appropriate by the BLM, a significant impact is unlikely.

Animals killed during earthmoving activities or through collisions with vehicles are irreversibly and irretrievably lost. Also, loss of habitat for wildlife that are displaced by proposed operations may be an irreversible and irretrievable loss.

There would be an irreversible and irretrievable commitment of the energy and materials used during construction, mining, and transport operations associated with the proposed project. Some foundations, pipelines, and mine structural support materials may be permanently abandoned in place due to safety and economic considerations, so they would be irreversibly and irretrievably lost.

4.10 SHORT-TERM USE OF THE ENVIRONMENT VS. LONG-TERM PRODUCTIVITY

For the purposes of this discussion, short-term use of the environment is that use during the LOP, and long-term productivity refers to the period after the project is completed and the area reclaimed.

The short-term use of the environment would affect the resources as discussed in Sections 4.1 through 4.7 above. This use and associated impacts would not significantly affect the long-term productivity of project-required lands or adjacent areas. After the project is completed and disturbed areas are reclaimed, the same resources that were present prior to the project, except the uranium and other minerals contained in the mined rock, would be available. It may take 20 years or more after the LOP for some areas to be adequately reclaimed; however, reclamation would provide conditions to support wildlife, livestock, and recreation. Use of project-required lands during the LOP would not preclude the subsequent long-term use of the area for any purpose for which it was originally suited prior to the project.

5.0 MITIGATION AND MONITORING

The mitigation and monitoring measures identified in this chapter have been summarized from materials presented in Sections 2.1.2.8 and 2.1.6, Chapter 4.0, and Appendix B. Measures were developed by GMMV during the mine permitting process, and by the BLM in response to impacts identified in Chapter 4.0 and during the scoping process. Mitigation and monitoring measures describe how project activities would be implemented to assure compliance with federal, state, and local laws, resource management goals and objectives for the project area, and additional environmental protection goals identified during IDT analyses and WDEQ-LQD reviews of the GMMV Jackpot Mine Permit Application (GMMV 1994). All mitigation and monitoring measures identified in this chapter would be applied to the Proposed Action and/or the other action alternatives.

The BLM LRA Manager would be the AO for the proposed project. Mitigation and monitoring measures identified in this chapter may be modified by the AO based on new information or to further minimize impacts. Additional IDT recommendations for further mitigation and monitoring measures may be developed during preconstruction and interim site inspections of the proposed project. Final mitigation and monitoring requirements would be determined by the AO.

Authorization to proceed with the implementation of this project on public lands would be contingent on receiving a completed Plan of Operations from GMMV, a WDEQ-LQD-approved Mine Permit for the Jackpot Mine, and USFWS concurrence on the T&E species impact analysis. IDT on-site environmental reviews may also be conducted.

Approval of alternative transportation corridor development would be contingent on completion of a site-specific cultural resource file search and Class III cultural clearance, paleontological clearance, and T&E, candidate, and state sensitive species surveys for each corridor. Construction, operation, and monitoring plans may also be required before project approval would be granted for specific project development activities.

The mitigation and monitoring measures identified herein would be adhered to on all federal, state, and private lands affected by federal undertakings, subject to landowner preferences or agreements. The AO, in consultation with other agency personnel (e.g., WDEQ, WGFD, USFWS) would approve road construction and/or improvement activities on a case-by-case basis when sensitive resource constraints (e.g., wildlife) are involved.

5.1 ADMINISTRATIVE REQUIREMENTS

All phases of the proposed project including mine site construction, road construction and/or improvement, production operations, and reclamation would be conducted by GMMV and their subcontractors in full compliance with all applicable federal, state, and local laws and regulations and within the guidelines specified in the BLM-approved Plan of Operations and WDEQ-LQD mine permit.

Reclamation plans would be provided as components of the Plan of Operations according to guidelines established in FLPMA and other criteria established by the BLM. They would also be provided as a component of the WDEQ-LQD-approved mine permit. Reclamation plans would detail all practices necessary for reclamation on areas not required for production operations, as well as those areas to be reclaimed upon completion of the project. Plans would include configurations of the reshaped topography and drainage systems, segregation of spoil and mine waste rock materials, surface manipulations, waste disposal practices, soil treatments, and species lists, and would incorporate the material applicable to reclamation presented in Chapters 2.0 and 4.0 and in Appendix B. An estimate of the time for commencement and completion of reclamation operations would also be included. A reclamation bond would be held by the BLM to ensure adequate reclamation of all project components.

5.1.1 WDEQ-LQD Mine Permit and Annual Reports

Pursuant to the Wyoming Environmental Quality Act (§35-11-411), GMMV must obtain a Permit to Mine from the WDEQ-LQD prior to further construction at the Jackpot Mine site. Most of the data necessary for the permit are contained in GMMV's mine permit application (GMMV 1994), which has been submitted to and reviewed by WDEQ-LQD. Typically, several rounds of review by WDEQ-LQD and responses by the applicant (GMMV) are required before a mine permit application is approved. Prior to issuance of the permit, the public is provided with an opportunity to review the mining and reclamation plan. If objections are filed, an administrative hearing is held before a final decision is made regarding the permit.

In addition to the WDEQ-LQD mine permit, annual reports must be filed to WDEQ-LQD 30 days prior to the anniversary date of the mining permit. GMMV, in compliance with the Wyoming Environmental Quality Act, would submit annual reports to both the WDEQ-LQD and the BLM containing information on mining operations including maps, cross sections, and aerial and other photographs. The reports would define the extent of new disturbance and total disturbance to date, topsoil stockpile and mine waste rock volumes, and the quantity of minerals mined. New construction (e.g., shop facilities, roads, sediment ponds, and monitoring sites) would also be described, as would any environmental problem areas and their associated mitigation plans. Reclamation activities for the reporting period would be specified and would include maps of reconstructed contours; a description of reclamation procedures; acreage of reclamation completed; results of revegetation efforts; and a summary of reclamation costs. A section would be included providing detailed mining and reclamation plans for the coming year, including a revised time schedule, a tabulation of the acreage disturbed and reclaimed, and maps. Further, annual reports would describe monitoring activities, present a summary of monitoring data, and describe corrective procedures for monitoring-identified problems. Monitoring and data summaries would include groundwater and surface water analyses, mine water discharge and subsidence data, overburden analyses, and vegetation and wildlife information.

5.1.2 WDEQ-LQD Stormwater Pollution Prevention Plan

GMMV would prepare a WDEQ-WQD SPPP for the proposed project. The plan would identify best-management practices, including erosion and pollution control procedures that would be implemented throughout the LOP to minimize surface water degradation. The SPPP would accompany the Plan of Development and Mine Permit.

5.1.3 WDEQ-AQD Air Quality Permit

An air quality permit from the WDEQ-AQD must be acquired prior to the commencement of construction and mining operations. Prior to issuance of the permit, the public is provided with an opportunity to review the proposed operations. If objections are filed, an administrative hearing is held before a final decision is made regarding the permit.

5.1.4 Other Permits

GMMV will comply with numerous additional regulatory requirements and obtain all necessary permits prior to the initiation of construction and mining operations. The authorizing actions associated with these requirements are listed in Table 1.1. Additional agencies and associated permits include, but are not limited to the following:

- NRC - Source Materials License and associated amendments, ER, and EA for activities at the Sweetwater Mill;
- WDEQ-WQD - permits to construct sediment-control and other water treatment facilities and an NPDES permit to discharge mine water to area water courses;

- WDEQ-Wyoming Industrial Siting Council - Industrial Siting Permit; and
- WSEO - a permit to appropriate groundwater for mine-water discharge (U.W. Form 5), a water well permit, and a permit to use and store water for potable purposes.

5.1.5 Preconstruction Planning and Design

GMMV would prepare and submit comprehensive mine site design plans prior to BLM approval of the Plan of Operations. These plans, at a minimum, would include the following: mine layout design, building dimensions, No Name Creek diversion channel specifications, volumes and cross sections of cut-and-fills, locations and dimensions of the mine waste rock pile and water storage ponds, fence locations and designs, access road ingress and egress, and other details as needed. Plans would be submitted prior to the initiation of construction and would be developed to minimize the amount of land disturbance.

Any proposed surface disturbance, such as road widening or new construction would be accompanied by appropriate engineering design specifications, geotechnical analyses, and mitigation plans. This information would be of sufficient detail to demonstrate that all environmental resources would be adequately protected or that impacts would be adequately mitigated.

The following areas or situations will require detailed designs, plans, and/or analyses:

- slopes in excess of 25%;
- areas within 500 feet of surface water and/or wetland areas;
- areas within 100 feet of ephemeral/ intermittent drainages;
- areas on unstable soils;
- construction with frozen material or during periods when soil material is saturated or when watershed damage is likely to occur; and
- construction at sites where cultural or paleontological resources are known to be present.

All sources of aggregate for construction materials necessary for road construction, road improvement, and maintenance would be identified by GMMV. The appropriate surface management agency (BLM, State of Wyoming) must approve the sources and times of extraction.

5.1.6 Hazardous Material and Solid Waste Management

All fuel storage facilities constructed and/or used as components of the project would be double-walled, lined, and/or surrounded by a containment berm of sufficient capacity to contain 150% of the capacity of the largest tank or combined tank totals. Hazardous materials would be used, produced, transported, stored, and disposed of in accordance with all applicable state and federal regulations, the HMS for the project (Appendix A), and EPA/RCRA permits for treatment, storage, and/or disposal of hazardous waste. Any hazardous material spills would be handled as specified in GMMV's SPCCP, which is required by the EPA, and GMMV would be responsible for reporting spills of hazardous materials and implementing applicable procedures, monitoring, and reporting requirements. Notice of any spill or leakage (i.e., undesirable event), would be immediately given by GMMV to the AO and other such federal and state officials (e.g., WDEQ) as required by law. Any oral notice shall be given as soon as possible, but within 24 hours, and oral notices shall be confirmed in writing within 72 hours of any such occurrence. Cleanup measures and monitoring would depend on the type and magnitude of the spill and whether the spill material could affect surface or groundwater. All project-related activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials would be conducted in such a manner as to minimize potential environmental impacts.

During project construction and operation, GMMV would store solid wastes collected on-site in appropriately designed containers. Solid wastes (garbage and refuse) would be hauled to state-approved sanitary landfills or other disposal sites. Waste products would be minimized through recycling of materials to the fullest practical extent. Solid wastes generated by the proposed mining operation would be disposed of in accordance with WDEQ Solid Waste Management Rules. Facilities such as porta-potties may be used to handle sanitary wastes at some locations.

Sewage treatment would be handled by existing septic tanks and drain fields at the Big Eagle facility; a similar system would be constructed at the proposed Jackpot Mine site. Underground sanitary facilities would consist of portable toilets that are pumped out regularly; sanitary waste would be transported to the surface and disposed of in the septic systems. A WDEQ-WQD permit to construct and operate the sewage treatment system (groundwater pollution control permit) would be obtained prior to construction.

5.2 RESOURCE-SPECIFIC MITIGATION REQUIREMENTS

5.2.1 Air Quality

Necessary air quality permits to construct and operate project-required facilities have been or would be obtained from the WDEQ-AQD, and permit guidelines would be adhered to by GMMV. Primary mitigation measures to reduce air quality impacts would include use of water sprays at ore transfer points (e.g., conveyors to stockpile, stockpile to haul trucks); watering of the active face of the mine waste rock pile; use of snow fences at topsoil stockpiles; use of covered haul trucks for ore transport; water applications along all access and haul roads to reduce fugitive dust emissions along these roads by a minimum of 40%; and prompt revegetation of disturbed areas. All roads would be gravel-surfaced and maintained by GMMV, as necessary, and all internal combustion equipment would be kept in good working order. In addition, open burning of garbage or refuse would be prohibited.

5.2.2 Topography

The proposed Jackpot Mine site was selected to avoid, where possible, steep slopes, rugged topography, and perennial and ephemeral/intermittent drainages. Additional mitigation for topography includes maximizing the use of existing disturbed areas (e.g., new and upgraded transportation corridors would follow existing roads, where possible); minimizing the amount of new area disturbed; prompt stabilization and reclamation of disturbed areas that are not required for the LOP (e.g., portions of road easement areas, the permanent No Name Creek diversion channel, and sediment dam); and, upon project completion, recontouring and reclaiming the mine site to blend with surrounding topography, pursuant to BLM and WDEQ-LQD reclamation criteria.

5.2.3 Mineral Resources

GMMV would monitor mined materials for gold and other valuable trace minerals to determine whether recoverable quantities of these minerals are present in mined materials. If recoverable quantities of these minerals are present and/or if oil and gas lessees decide to develop leases above the proposed mine during operations, additional mitigation measures may be developed by the BLM.

5.2.4 Geologic Hazards

Mitigation for geologic hazards include the design and construction of surface structures and the underground mine such that moderate earthquakes (intensity VI to VIII on the modified Mercalli scale) would not damage facilities; avoidance of stabilized sand dunes and areas prone to landslides and flooding, where possible; and where sand dunes and/or flood and landslide prone areas are impacted, implementation of BLM-approved, site-specific ground surface stabilization and reclamation measures. To preclude subsidence, stable support pillars would be used during mining, and portals would be permanently closed and backfilled to 100 feet upon project completion.

5.2.5 Paleontological Resources

The potential paleontological value of project-required lands would be assessed prior to construction activities, based on the results of a Class I paleontological survey, and the BLM would determine whether a Class III survey of proposed disturbance areas would be required (BLM 1993b). Important paleontological resources would either be avoided or appropriately recovered prior to construction activities, and monitoring during construction may be required by the BLM in certain areas. If important fossils are discovered during construction, activities that would further disturb these fossils would cease until a BLM-approved paleontologist evaluates the site and appropriate mitigation measures are applied.

5.2.6 Soils

Adverse impacts to soils would be mitigated by minimizing disturbance; avoiding construction with frozen soil materials and in areas with high erosion potential (i.e., sensitive soil areas - sand dunes, steep slopes, floodplains), where possible; salvaging and selectively handling topsoil from disturbed areas and adequately protecting stockpiles to prevent erosion and maintain some soil microflora and microfauna; using appropriate erosion and sedimentation control techniques including but not limited to, diversion terraces, riprap, and matting; and promptly revegetating disturbed areas with adapted species. Temporary erosion control measures such as temporary vegetation cover; application of mulch, netting, or soil stabilizers; and/or construction of barriers may be used in some areas to minimize wind and water erosion and sedimentation prior to vegetation establishment. Further site-specific mitigation measures may be applied in sensitive soil areas as directed by the BLM.

All suitable topsoil materials would be salvaged from disturbed areas and stockpiled for use during reclamation. Following site grading and recontouring, approximately 38 inches of topsoil and/or other suitable material would be used to reconstruct the reclamation soil profile. Methods and schedule of replacement, any soil reconstruction procedures, depth of topsoil, erosion control measures, water conservation practices, and any soil amendments would adhere to WDEQ-LQD Guideline No. 1 specifications (WDEQ-LQD 1984). Compacted soils would be ripped and tilled as necessary, prior to reseeding with indigenous, adapted species. The entire mine site would be reclaimed upon project completion, such that soil stability and productivity would be restored to approximate premining conditions.

Appropriate erosion control and revegetation measures would be employed. Grading and landscaping would be used to minimize slopes, and waterbars would be installed on disturbed slopes with grades of 6% or greater and may be installed on disturbed slopes with grades of less than 6% in areas with unstable soils where seeding alone would not adequately control erosion. Erosion control efforts would be monitored by the BLM and GMMV and augmented as necessary to control erosion.

Any accidental soil contamination by spills of potentially hazardous materials would be immediately cleaned up and the soil disposed of or rehabilitated as specified in GMMV's SPCCP.

5.2.7 Water Resources

The principle mitigation measures for surface water and groundwater impacts are given as components of the Proposed Action and alternatives (see Section 2.1.2.8). A summary of these and other water resource mitigations is presented below.

5.2.7.1 Water Quality/Erosion

Mine-water quality would be monitored prior to discharge, and would be treated as necessary to comply with NPDES permit requirements (see Section 2.1.2.7).

The water-quality monitoring plan (see Sections 2.1.2.8 and 5.3.5) would be initiated upon project authorization from the BLM and WDEQ. The monitoring program would track changes in surface and groundwater quality, and in the event that decreases in surface water and/or groundwater quality are noted, WDEQ would be notified. Consultation with the WDEQ, BLM, and other relevant agencies would be conducted to develop appropriate mitigative/remedial strategies, and these strategies would be implemented.

Hazardous materials would be properly contained in appropriately designed storage facilities, and areas potentially contaminated by accidental spills would be cleaned up immediately. Additionally, all GMMV employees would be trained to respond adequately to an accidental spill and informed of the potential impacts that can result from accidental spills. Appropriate containment and cleanup equipment would be available at the mine and/or Big Eagle facilities site. Guidelines specified in GMMV's SPCCP would be adhered to such that any spill or accidental discharge of a hazardous material would be remediated.

In addition to minimizing the amount of disturbance necessary to conduct the project, erosion control measures would be applied at all disturbed areas. Specific erosion control measures include diversion ditches and terraces, riprap, matting, temporary sediment traps, silt fencing, waterbars, and timely stabilization and revegetation. Erosion-prone areas would be avoided wherever possible, and where these areas must be impacted, construction would occur during late summer, fall, and winter to avoid high-flow periods. Project activities would be conducted as specified in the WDEQ-required SPPP.

Culverts would be installed at all appropriate locations as specified in *Manual 9112-Bridges and Major Culverts* (BLM 1984) and *Manual 9113-Roads* (BLM 1985, 1991). Streams and ephemeral drainages would be crossed perpendicular to flow, where possible, and all stream-crossing structures would be designed to carry the 25-year discharge event or other capacities as directed by the BLM.

Erosion transect monitoring would be conducted as described in Sections 2.1.2.8 and 5.3.5, to provide a gauge of soil loss on Fourth and No Name Creeks. Excessive erosion within stream channels (e.g., greater than one foot) would trigger mitigation efforts to reduce continued soil erosion and loss of vegetation. Stream channel cross-section monitoring may lead to modifications in the one foot trigger for implementation of mitigation efforts. Mitigation measures would be implemented as directed by WDEQ and/or the BLM and may include development of alternate mine water discharge points to reduce channel flow rates; use of in-channel velocity reduction structures; use of riprap to slow water velocities and prevent erosion; and/or streambank revegetation to enhance soil stability.

5.2.7.2 Water Quantity

Mine-water discharge/flow rates into Fourth Creek and groundwater levels would be monitored as described in Sections 2.1.2.8 and 5.3.5. If mine-water discharge rates exceed 732 gpm for 30 consecutive days, WDEQ would be consulted and alternate discharge points and associated control structures would be developed, as necessary, to ensure that surface water flows do not exceed channel capacity and cause undesirable erosional impacts. If groundwater drawdown levels in monitoring wells exceeds five feet, GMMV would initiate consultations with the WDEQ and BLM to determine if drawdowns have resulted in surface impacts, and what, if any, mitigation measures should be applied. Mitigation options may include water injections to increase groundwater levels; increased monitoring of spring, stream, and seep flows, and/or wetlands to show whether drawdowns are affecting these resources; surface water discharge to affected springs, streams, seeps, and wetlands; and other measures as outlined in the WDEQ-LQD-approved mine permit or developed by the BLM, WDEQ, and other relevant agencies.

5.2.8 Noise

Noise mitigation would be applied at the mine site and at ventilation shafts as determined necessary by the BLM. A silencer diffuser or sound-absorbing materials would be used to lower mine exhaust fan noise to approximately 75 dBA 20 feet from the fan. All engines required for project activities would be properly muffled and maintained. Construction activities proximal to active raptor nests and in sage grouse breeding and nesting areas would be limited to periods when activities would not adversely affect these species. In addition, no project-required ore-hauling activities would occur during the period of one hour before dawn until 9:00 a.m. during the sage grouse breeding season (i.e., March 1 through April 30).

5.2.9 Vegetation

Removal and disturbance of vegetation would be kept to a minimum during mine site and access/haul road construction. Transportation corridor construction would be located to avoid and/or minimize impacts in areas of high value (e.g., potential sensitive plant habitats, wetlands/riparian areas, sand dunes), where possible.

Proper erosion and sedimentation control techniques would be incorporated by GMMV into the design of the mine site, facilities, and road upgrading and construction. Revegetation using a BLM-approved, locally adapted seed mixture containing grasses, forbs, and shrubs would begin in the first appropriate season following disturbance. Vegetation removed would be replaced with plants of equal value using procedures that include:

- deep ripping of compacted soils prior to reseeding;
- surface pitting/roughening prior to reseeding;
- broadcast or drill seeding, depending on site conditions;
- fall reseeding (September 15 to freeze-up), where feasible;
- spring reseeding (prior to April 15) if fall reseeding is not feasible;
- utilization of native cool season grasses, forbs, and shrubs in a mixture approved by the WDEQ-LQD and BLM;
- addition of BLM-approved, introduced/adapted species (e.g., crested wheatgrass, Russian wildrye, winter wheat, etc.) to the seed mix on selected areas to facilitate site stabilization and/or after all attempts at vegetation reestablishment with native species are unsuccessful, as determined during monitoring;
- use of seed mixes certified to be free of noxious weeds;
- appropriate, BLM-approved weed control techniques; and
- fencing of certain sensitive reclamation sites (e.g., riparian and sand dune areas) as determined necessary by the BLM.

Recontouring and seedbed preparation would occur immediately prior to reseeding at unused portions of the mine site and along approximately 20 feet on both sides of roads. In the case of road upgrading and/or new construction, GMMV would initiate reclamation of the road location and adjacent disturbed habitat as soon as possible. Roads constructed under Alternatives A, B, or C would be reclaimed entirely upon project completion, as deemed appropriate by the BLM. Reclamation procedures would adhere to Reclamation Plan specifications (Appendix B, GMMV 1994), the BLM's *Wyoming Policy on Reclamation* (BLM 1990b), and relevant WDEQ policies and procedures. Additional site-specific mitigation may also be applied as directed by the BLM for impacted sand dunes along proposed transportation corridors. Plant species used in reclamation are discussed in Section 2.1.2.6 and

Appendix B. Reclamation would be monitored annually to determine and ensure successful establishment of vegetative cover and diversity. The reclamation bond would not be released until reclamation requirements are satisfied.

GMMV would be responsible for implementation of a noxious weed control program in cooperation with the BLM and Fremont and Sweetwater Counties to ensure that noxious weed invasion does not become a problem. Weed-free certification by county extension agents would be required for grain, straw, or hay used for mulching revegetated areas.

GMMV would minimize disturbance of riparian areas by providing a 500-foot vegetation buffer between disturbances and riparian areas, where possible. Established crossings would be utilized, where possible, and all staging areas would be placed away from riparian sites. Avoidance of riparian areas would be the primary objective.

Where riparian areas must be impacted, the primary objective would be soil stabilization through the reestablishment of vegetative cover by native species. Exact procedures and species used would be dependent on site-specific conditions. Compliance with Executive Orders 11988 (floodplain protection) and 11990 (wetland protection) would be assured through consultation with the COE, and acquisition of associated Section 401 and 404 permits.

Further mitigation for disturbed wetland/riparian areas include:

- development of crossings only during dry conditions (i.e., late summer, fall, winter);
- restoration of areas to preproject conditions, and if impermeable soils contributed to wetland formation, compaction of soils to reestablish impermeability;
- selective salvaging, stockpiling, and replacement of wetland/riparian area topsoil to facilitate the reestablishment of functional wetland/riparian areas; and
- recontouring and seeding of wetland/riparian area banks with BLM- and WDEQ-approved, adapted species in the first appropriate season after completion of activities.

GMMV proposes to establish a riparian habitat enhancement and monitoring program in association with the development of this project (see Sections 2.1.3 and 5.3.6). This program could include the creation and/or enhancement of approximately 20 acres of riparian habitat in the Green Mountain area in association with the development of the proposed project. Mitigation and enhancement measures to restore or create new riparian areas would be developed in consultation with the BLM, WGFD, WDEQ, and other relevant agencies and individuals.

5.2.10 Wildlife and Fisheries

In addition to minimizing the amount of land disturbance required for the proposed project, prompt reclamation of disturbed areas, and road selection and design to minimize disturbances to areas of high wildlife value (e.g., wetland areas), the following mitigations for employee-related disturbances to wildlife would also be applied:

- implementation of an employee education program regarding WGFD rules and regulations for project-required lands and adjacent areas, how disturbances affect wildlife, and appropriate actions to minimize wildlife-related disturbances;
- GMMV employee support of WGFD surveillance in the area by immediately reporting all observed illegal harvesting of wildlife on and adjacent to project-required lands;
- disciplinary action by GMMV against employees caught violating wildlife laws or project-specified wildlife mitigation; and
- implementation of a car or van pool program to reduce potential vehicle noise disturbances and possible wildlife/vehicle collisions.

The mine site would be fenced to prevent big game access, and further fencing, netting, or other measures may be used to isolate locations containing potentially hazardous materials. These mitigations would be monitored for effectiveness by the BLM throughout the LOP and if proven ineffective, further mitigation measures would be applied.

During the winter, escape openings would be provided along access roads, as designated by the BLM and WGFD, to facilitate big game movement from plowed roads. To minimize displacement and stress of animals, GMMV would instruct workers and contractors to adhere to designated speed limits (35 mph) and avoid stopping and exiting their vehicles, especially in winter while there is snow on the ground.

A raptor nesting survey of project-required lands and an adjacent 0.75-mile buffer would be conducted prior to and within one year of project construction activities to document the status of raptor nests in the area, and future surveys and raptor nest monitoring would be conducted as deemed necessary by the BLM and WDEQ. Any potential conflicts between active nest sites and project-related activities would be resolved by the BLM and WDEQ in consultation with the USFWS and WGFD. In addition, project construction activities would not occur within 0.75 mile of active raptor nests during the nesting season (February 1 through July 31). GMMV would notify the BLM immediately if raptors are found nesting on project facilities, and GMMV employees would assist the BLM as necessary in erecting artificial nesting structures.

Prior to and within one year of the proposed start of any construction activity, areas designated by the BLM would be surveyed for sage grouse leks. No surface disturbance would be allowed within 0.25 mile of a sage grouse lek center at any time, except where road upgrades may be required, and no construction activities would be allowed within 2.0 miles of lek centers between March 1 and June 30 to protect probable sage grouse nesting habitat. In addition, no project-related ore-hauling activities would be conducted during the period from one hour before dawn until 9:00 a.m. during the sage grouse breeding season (March 1 through April 30).

Potential impacts to fisheries would be minimized by using proper erosion control techniques (see Sections 5.2.6 and 5.2.9). Construction within 500 feet of open water and 100 feet of intermittent and ephemeral channels would be avoided where possible, and stream crossings would be constructed during the period of lowest flow (i.e., late summer and fall).

5.2.11 Wild Horses

Loss of forage for wild horses would be limited by restricting disturbance to the minimum area necessary to conduct project operations. Reclamation of nonessential areas (i.e., portions of road easements) would provide forage within a few years, and upon project completion, reclamation would provide additional forage at the mine site and along any alternative transportation corridors designated for reclamation. Field personnel would be instructed to minimize disturbance to wild horses, especially during known stress periods such as winter, breeding, and foaling seasons. Mine-site fencing would preclude wild horse use of the area.

5.2.12 Threatened and Endangered/Candidate/ Other Species of Concern

Surveys for T&E, candidate, and other plant and animal species of concern would be implemented prior to and within one year of project construction activities. If any T&E species and/or their crucial habitat (e.g., bald eagle nests or roosts, prairie dog colonies with sufficient size and burrow densities to constitute black-footed ferret habitat) is discovered on or adjacent to project-required lands, the BLM, USFWS, and WGFD would be consulted and appropriate mitigation measures would be developed and implemented to ensure that these species are not impacted. If candidate plant and animal species and/or their crucial habitats are found on the area, construction activities would be relocated or delayed such that activities would not disturb these species or habitats. Habitats in which other species of concern are likely to occur would be avoided, where possible.

5.2.13 Cultural and Historic Resources

Impacts to cultural resources would be mitigated following procedures as specified in 36 CFR 800. Class I and Class III inventories have been or would be conducted on all lands affected by federal undertakings unless landowner denial for access is documented in writing. Cultural sites identified during inventories would be avoided, where possible. Areas adjacent to perennial waters and aeolian deposits would also be avoided, where possible.

All resources identified in Class III surveys or during monitoring would be evaluated for NRHP eligibility in consultation with the BLM and SHPO. If any NRHP eligible or listed site cannot be avoided, a data recovery program would be implemented as directed by the BLM in consultation with SHPO, the Advisory Council on Historic Preservation, and GMMV. If a large number of sites cannot be avoided, a Programmatic Agreement among the aforementioned parties may be developed. In the absence of a Programmatic Agreement, any discovered historic properties would be subject to mitigation through data recovery.

Any cultural resource (historic or prehistoric site or artifact) discovered by GMMV personnel or other individuals working on their behalf would be immediately reported to the AO, and further surface-disturbing activities at the site would cease immediately to ensure proper handling of the discovery by qualified archaeologists. An evaluation would be made by the AO to determine appropriate actions to prevent the loss of significant cultural resources. GMMV would be responsible for the cost of the evaluation, and any decision as to proper mitigation measures (e.g., data recovery) would be made by the AO. Project personnel would be instructed not to disturb cultural resource sites or collect artifacts, and those caught doing so would be disciplined and may be dismissed and prosecuted.

In addition to Class I and Class III inventories, construction activities in areas where the BLM believes there is a high potential for buried cultural deposits (e.g., sand dunes), would be monitored by a BLM-permitted archaeologist. Auger or other types of testing in these areas may also be conducted. Further, Site 48FR479 would be monitored by GMMV throughout the LOP, as deemed appropriate by the BLM, WDEQ, and SHPO, and if it is determined that the site may be impacted, mitigation would be applied following procedures in adherence with Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800).

Where possible, areas within 0.25 mile of historic trails would be avoided. In the event that a historic trail must be impacted, activities would be located within areas of existing disturbance and/or outside of contributing sections (e.g., along the western side of the Crooks Gap Wamsutter Road), where possible. Historic trails would be evaluated prior to disturbance, by a qualified historian, and appropriate mitigation measures would be developed by the BLM, SHPO, the Advisory Council on Historic Preservation, and GMMV, and applied as necessary.

If any area of religious or cultural importance to Native American groups is identified on public lands, the BLM would review the potential impacts on a site-specific basis to determine appropriate mitigation measures.

5.2.14 Socioeconomics

GMMV has committed to using local labor for approximately 75% of its required labor force, and the BLM encourages GMMV to implement policies that maximize the use of existing local labor.

GMMV would schedule concentrations of project traffic, such as convoys and/or heavy traffic flows to avoid periods of expected heavy traffic flows associated with recreation (e.g., opening day of pronghorn season). GMMV would educate employees regarding traffic safety and appropriate speed limits on area roads, and would install signs on project-required roads to inform travelers of potentially hazardous situations. In addition, road improvements and maintenance necessary to ensure safe travel conditions and prevent degradation along project-required roads would be conducted by GMMV. Parking would be restricted to the Jackpot Mine and Big Eagle Facilities sites.

5.2.15 Land Use

Primary mitigation measures to ensure no permanent changes in land use occur as a result of this project include the removal of all surface equipment and structures upon project completion and prompt reclamation of disturbed areas with locally adapted native plant species. Reclamation of nonessential areas disturbed during construction activities (e.g., 40 feet of road easement areas) would be accomplished in the first appropriate season after disturbance. GMMV would repair or replace fences and cattle guards, gates, and other structures along project-required roads to maintain current BLM standards. Cattle guards would be used instead of gates for livestock control on most roadways. Livestock access to existing water sources would be maintained.

Mitigation to prior rights would include:

- limiting mining operations to lands covered under the WDEQ-LQD-approved Jackpot Mine permit;
- regrading and repairing roads as necessary in areas damaged by project activities;
- avoiding existing ROWs where possible, and where existing ROWs must be impacted (i.e., crossed during road improvements and/or upgrades), identifying and flagging these ROWs in advance, and using backhoe and hand excavation at crossings until the exact locations of lines are determined; and
- restoring native vegetation on disturbed areas as soon as practical.

5.2.16 Visual Resources

Visual resource impacts would be mitigated by minimizing the amount of disturbance necessary to implement the project and limiting new disturbances to areas of existing perturbation (e.g., along existing roads, at the Big Eagle facilities site, at the Jackpot Mine site), where possible. Revegetation with native species would be initiated as soon as possible after disturbance. Aboveground facilities would be appropriately sited, and those not requiring safety coloration would be painted with appropriate nonreflective standard environmental colors to blend with the existing landscape. Topographic screening, vegetation manipulation, project scheduling, and traffic control procedures would be employed as deemed appropriate by the BLM to further reduce visual impacts.

5.3 MONITORING

Proposed Jackpot Mine construction and operation has been designed to minimize the potential for deleterious environment effects, and monitoring programs have been incorporated into the Mine Plan to measure achievement of this goal (GMMV 1994). GMMV would be responsible for continuation of current monitoring plans and implementation of new monitoring plans as required by the BLM and/or WDEQ during project construction and operation.

5.3.1 Air Quality

Ambient air quality monitoring would be conducted in accordance with the requirements of the WDEQ-AQD permit for the proposed project. Radon monitoring would be conducted per EPA monitoring protocol.

5.3.2 Mineral Resources

GMMV would monitor mined materials for gold and other valuable trace minerals to determine whether recoverable quantities of these minerals are present in mined materials.

5.3.3 Paleontological Resources

In addition to the predisturbance survey conducted as deemed appropriate by the BLM, specific, unavoidable, high-value paleontological sites would be monitored during construction as necessary by a qualified paleontologist. If significant paleontological materials are discovered during construction, all activities that would further disturb these materials would cease immediately, and the AO would be notified by GMMV or their subcontractor. A BLM-approved paleontologist would evaluate the discovery and appropriate mitigation measures would be developed and applied prior to further project activities at the site.

5.3.4 Soils

GMMV would conduct regularly scheduled monitoring of erosion control structures to ensure maintenance of the operating integrity of these structures. Monitoring procedures and schedules would be specified in the Plan of Operations. Appropriate remedial action would be taken by GMMV to correct nonfunctioning structures. Further erosion monitoring would be conducted along Fourth and No Name Creeks as specified in Section 5.3.5.1.

5.3.5 Water Resources

Monitoring systems have already been implemented to obtain baseline data for the Jackpot Mine Permit Application (GMMV 1994), and a detailed monitoring plan has been included as a component of the proposed project to allow for evaluation of any mine-induced impacts to surface water and groundwater quality and/or quantity, and erosion (see Section 2.1.2.8). Map 2.1 shows the location and type of monitoring sites. Water monitoring would be initiated upon project authorization from the BLM and WDEQ, and would provide data on changes that have occurred during mining operations. At the end of the first year of mine-water discharge, monitoring data would be assessed, schedules reviewed, and a new monitoring proposal would be prepared for consideration by the BLM and WDEQ. GMMV, in consultation with WDEQ, has developed monitoring "triggers" designed to identify points when mitigative actions would be employed. These triggers are based on known existing environmental conditions, and are presented below for each of the proposed monitoring parameters. Appropriate mitigation strategies would be developed and implemented in the event that monitoring reveals unforeseen, adverse mining effects to water resources.

5.3.5.1 Water Quality/Erosion

Mine-water quality would be monitored prior to discharge, and would be treated as necessary to comply with NPDES permit requirements (see Section 2.1.2.7).

The water-quality monitoring plan (see Section 2.1.2.8) would be initiated upon project authorization from the BLM and WDEQ, and would include grab sampling for the water-quality parameters listed in WDEQ-LQD Guideline 8, Appendix 2 (WDEQ 1990). Water-quality analyses would adhere to EPA-approved methods (40 CFR 135). Monitoring frequencies would be as specified in the WDEQ-LQD-approved mine permit. The monitoring program would track changes in surface and groundwater quality, and in the event that decreases in surface water and/or groundwater quality are noted, WDEQ would be notified. Consultation with the WDEQ, BLM, and other relevant agencies would then be conducted to develop appropriate mitigative/remedial strategies.

Erosion monitoring would be conducted quarterly at existing transects along Fourth and No Name Creeks as described in Section 2.1.2.8 and in accordance with the WDEQ-LQD-approved mine permit. Monitoring would provide a gauge of soil loss in these drainages, and if excessive erosion (i.e., greater than one foot) is noted, mitigation efforts would be developed in consultation with the WDEQ and BLM, and would be applied to reduce continued soil erosion and loss of vegetation. In addition to transect monitoring, the amount of cutbanks and scouring in these drainages would be monitored quarterly by measuring the length of bare ground along representative portions of the channels.

5.3.5.2 Water Quantity

Mine-water discharge/flow rates into Fourth Creek, surface water flow rates in existing channels, and water levels in groundwater wells and at the existing pits at the Big Eagle Mine would be monitored as described in Section 2.1.2.8 and/or as specified in the WDEQ-LQD-approved mine permit. Mine-water discharge rates would be monitored using a continuous recording device to determine whether rates exceed predicted amounts, and if discharge exceeds 732 gpm for 30 consecutive days, WDEQ would be consulted and alternate discharge points and associated control structures would be developed as necessary to ensure that surface water flows do not exceed channel capacity and cause undesirable erosional impacts. Surface water flows in East Cottonwood Creek, the West Fork of Middle Cottonwood Creek, and in unnamed gullies within one mile of the decline portals would be monitored each year during August, September, and October to determine whether base flow changes occur that can be attributed to mine dewatering activities. Surface water flows in Crooks Creek, Sand Springs, and Fourth Creek would be monitored quarterly. If surface water flows are shown to be decreasing as a result of mining, the WDEQ would be consulted and appropriate mitigation strategies would be developed and implemented. Groundwater levels in existing wells would be periodically monitored, and if drawdowns exceed 5 feet, GMMV would initiate consultations with the WDEQ and BLM to determine if drawdowns have resulted in surface impacts, and what, if any, mitigation measures should be applied.

5.3.6 Vegetation

GMMV, in cooperation with the BLM and WDEQ, would be responsible for monitoring reclamation success using criteria specified by the BLM and WDEQ-LQD. The reclamation monitoring program shall include written documentation to be furnished to the BLM and WDEQ-LQD regarding the success of reclamation. Prior to bond release, monitoring results over two consecutive years must document that revegetation is comparable to premining conditions, per WDEQ-LQD criteria.

GMMV proposes to establish a riparian habitat enhancement and monitoring program in association with the development of the proposed project, and the program would be developed and implemented upon project authorization from the BLM and WDEQ. While impacts to riparian resources are not anticipated from drawdown or dewatering effects, GMMV would take proactive steps to enhance the riparian/wetland habitat resources on approximately 20 acres of Green Mountain. Riparian habitat enhancement and monitoring measures would be as specified in Section 2.1.3 and the WDEQ-LQD-approved mine permit, and would be developed on a site-specific basis by GMMV in consultation with the BLM, WDEQ, WGFD and other relevant agencies and individuals (e.g., grazing lessees).

Riparian habitat monitoring would be conducted on areas that could potentially be impacted by drawdown, as well as locations outside potential drawdown areas. Monitoring would be designed and implemented to determine whether mining activities are affecting long-term changes in wetland characteristics within the area. Additionally, monitoring would be conducted on proposed riparian enhancement sites to determine the effectiveness of enhancement measures. Monitoring parameters would likely include vegetative characteristics, water quality and quantity components, and wildlife use information. Trigger levels for mitigative action to riparian/wetland habitats would include any indication that negative changes to these areas have occurred or are occurring, including but not limited to, water level changes and/or loss or lessened abundance of riparian vegetation.

5.3.7 Wildlife and Fisheries

Throughout the LOP, GMMV would monitor winter big game use, raptor nesting, and sage grouse leks on and adjacent to project-required lands as directed by the WDEQ and/or the BLM to ensure that these sensitive resources are protected. Any big game, raptor, or game bird mortality on project-required lands would be reported by GMMV to the BLM and/or WGFD as soon as practical, as would any observed illegal wildlife harvest. GMMV, in cooperation with the BLM, would also monitor the effectiveness of mine-site fencing, netting, and pool covers for restricting wildlife access.

5.3.8 Cultural and Historic Resources

In addition to Class I and Class III inventories, construction activities in areas where the BLM believes there is a high potential for buried cultural deposits (e.g., sand dunes), would be monitored by a BLM-permitted archaeologist. The Class III inventory would identify areas of high, moderate, and low potential for significant cultural resources, which may be utilized in developing monitoring plans. If historic or prehistoric materials are discovered during construction, all activities at the site would cease immediately, and appropriate BLM personnel would be notified by GMMV or their subcontractor to assure proper handling of the discovery by a qualified archaeologist. Auger or other types of testing in some areas may be required by the BLM. Further, Site 48FR479 would be monitored by GMMV throughout the LOP, as deemed appropriate by the BLM, WDEQ, and SHPO, and if it is determined that the site may be impacted, mitigation would be applied following procedures in adherence with Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800).

5.3.9 Land Use

Signs would be installed along project-required roads as deemed appropriate by the BLM, and GMMV would monitor and maintain these signs to ensure they are in proper repair and are placed in appropriate locations. Construction monitoring by the BLM may be conducted where roads cross existing underground pipelines.

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6.0 CONSULTATION AND PREPARERS

Personnel contacted or consulted during preparation of this EIS are listed in Table 6.1. The list of preparers and participants is given in Table 6.2.

Table 6.1 Personnel Contacted or Consulted, GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Agency or Organization	Individual	Position
Advanced Sciences, Inc.	George Matthews	Air Quality Specialist
	Lonnie Mollberg	Manager
	Tyler Smart	Hydrology Specialist
Apache Corporation	M.T. Fitzgerald	Senior Landman
Basic Oil of Wyoming, Inc.	Robert J. Clark	President
Bureau of Land Management		
Casper Office	Roger Miller	Geologist/Geohydrologist
Great Divide Resource Area	John Ahlbrandt	Wild Horse Specialist
	Mike Calton	Range Conservation Officer
	Gary DeMarcay	Cultural Resource Specialist
	Beverly Derringer	Realty Specialist
	John G. Loutas	--
	John Spehar	Wild Horse Specialist
Lander Resource Area	Bill Bartlett	Realty Specialist
	Greg Bautz	Soil Scientist
	Craig Bromley	Archaeologist
	Fred Georgeson	Geology and Mineral Resources Specialist
	Jack Kelly	Area Manager
	John Likens	Range Conservation Officer
	Gary Long	Recreation/Visual Resources Specialist
	Phyllis J. Michaud	Minerals Clerk
	Sue Oberlie	Wildlife Biologist
	Roy Packer	Range Conservation Officer
	Ed Womack	Chief, Minerals Staff

Table 6.1 (Continued)

Agency or Organization	Individual	Position
Rawlins District Office	Mary Apple	Public Affairs Specialist
	Walt George	Realty Specialist
	Larry Kmoch	Chief, Branch of Solid Minerals
	Al Pierson	District Manager
	Indy Thompson	Office Automation
	Bob Tigner	Planning and Environmental Specialist
	Brenda Vosika	Mining Engineer
State Office	Marty Griffith	Hazardous Material Specialist
	Jon Johnson	Natural Resource Specialist
	Carl Santmyer	Socioeconomic Specialist
	Rick Schuler	Natural Resource Specialist
	Roger Wickstrom	Natural Resource Specialist
Carbon County T.V. and Radio Shack	Don Van Horn	--
Carbon County, Wyoming		
Chamber of Commerce	--	--
City of Rawlins	Judy Dixon	Mayor
Economic Development Commission	Gene McMillen	Director
Central Wyoming College	Joe Dolan	Learning Resource Center
Fremont County, Wyoming		
City of Lander	--	--
City of Riverton		
Chamber of Commerce	--	--
Economic Betterment	--	--
Memorial Hospital	--	--
County Assessor	Loraine Ocenas	Assessor
County Commissioners	Jane Adamson	Vice-chairman
	Clayton Hull	Commissioner
	Valerie Hafner Phifer	Commissioner
	Ray Price	Planning Director
	Thomas Satterfield	Commissioner
	Ralph Urbigkeit	Chairman
Geological Survey of Wyoming	Gary B. Glass	State Geologist

Table 6.1 (Continued)

Agency or Organization	Individual	Position
Individuals	John Abel	Engineering Geologist
	John Dewitt	--
	Kelly Hunt	--
	Joe Reed	--
	Mrs. Ray Weber	Weber Ranch Company
	Don Williams	Big Mountain Insurance
Jeffrey City	Ron Wilmes	Businessman
Kennecott Energy Corporation	John Forth	Hydrologist
	Mike Gibson	Vice President
	Allan Massey	Environmental Officer
	Oscar A. Paulson	Manager, Sweetwater Mill
	David Skolasinski	Environmental Projects Manager
LM Olson Construction	Greg Olson	President
Native American Tribes		
Northern Arapahoe Council	Francis Brown	--
	Harvey Spoonhunter	Chairman
Northern Cheyenne Council	--	Chairman
	Steven Brady	--
	Bill Tall Bull	--
Shoshone Council	Darwin Sinclair	Chairman
	John Tarnesse, Sr.	--
	Star Weed	Shoshoni Business Council
	Haman Wise, Sr.	--
Uinta-Ouray Council	--	Chairman
Ute Mountain Tribe	--	Chairman
Ute Tribal Council	Luke Duncan	Chairman
Natural Resource Conservation Service	Larry Murphy	Soil Conservationist
Pronghorn Anthropological Associates	Marv Hatcher	Archaeologist
Rice Enterprises	John Douglas Rice	--
South Central Industrial Association of Wyoming	Dave Slater	President
Sweetwater County, Wyoming	Fred Radosevich	Chairman, Board of Commissioners

Table 6.1 (Continued)

Agency or Organization	Individual	Position
Sweetwater Uranium Mill	Oscar Paulson	Manager
U.S. Bureau of Reclamation	Elizabeth Cordova-Harrison	--
U.S. Energy/Crested Corporation	Sharon Miller Kenneth Webber	Executive Secretary Environmental Coordinator
U.S. Environmental Protection Agency	Max H. Dodson	Director, Water Management Division
U.S. Fish and Wildlife Service	Charles Davis	State Supervisor
U.S. Soil Conservation Service		
Lander Field Office	Tom Gustafson Jane Youngmire	Soil Scientist Soil Scientist
University of Wyoming, Geology Museum	Brent Breithaupt	Museum Curator
Wind River Multiple Use Advocates	Alice Gustin William G. King	Vice President Secretary
Wyoming Department of Commerce	John T. Keck	--
Wyoming Department of Employment		
Riverton Job Service	--	--
Wyoming Department of Environmental Quality	Vanessa L. Forselius	Senior Economist
Air Quality Division	Bernie Dailey John Erickson	Engineering Supervisor --
Land Quality Division	Jim Luther Mark Moxley	Supervisor District Supervisor
Water Quality Division	Roger Schaffer John Wagner	-- Program Supervisor
Wyoming Department of Revenue	Richard Hopson Richard Marble	Mineral Tax Division Mineral Tax Division
Wyoming Employment Security Commission	Gordon Wolford	Statistician

Table 6.1 (Continued)

Agency or Organization	Individual	Position
Wyoming Game and Fish Department	Thomas C. Collins	Environmental Coordinator
	Greg Hiatt	Biologist
	Pat Hnilicka	Biological Services
	Jack Pellerin	Biological Services
	Larry Roberts	Biological Services
Wyoming House of Representatives	Eli D. Bebout	Representative
	Doug Chamberlin	Speaker
	John DeWitt	Representative
	Joe Reed	Representative
	Harry B. Tipton	Representative
	William J. Vasey	Representative
	Loren Willford	Representative
Wyoming Natural Diversity Data Base	Mary Neighbours	Information Specialist
Wyoming Outdoor Council	Dan Heilig	Associate Director
Wyoming Public Service Commission	Jon F. Jacquot	Chief Engineer
Wyoming State Historic Preservation Office	--	--
Wyoming State Senate	Henry H.R. Coe	Senator
	Jerry B. Dixon	President
	Robert Grieve	Senator
	Robert Peck	Senator

Table 6.2 List of Preparers and Participants, Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Name	Education/Experience	EIS Responsibility
ADVANCED SCIENCES, INC.		
George Matthews, Jr.	M.S. Mineral Resource Ecology; 18 years professional experience	Air Quality
Lonnie Mollberg	M.B.A.; 23 years professional experience	Project Management
Tyler Smart	B.S. Civil Engineering; 24 years professional experience	Hydrology
BLM INTERDISCIPLINARY TEAM		
Greg Bautz	B.S. Natural Resource Management; 15 years professional experience	Soils
Craig Bromley	B.A. Anthropology; 16 years professional experience	Cultural Resources
Tom "Jeff" Carroll	M.S. Plant Ecology, B.S. Forestry and Wildlife Management; 15 years professional experience	Wildlife
Gary DeMarcay	M.S. Anthropology, B.S. Anthropology; 17 years professional experience	Cultural Resources
Beverly Derringer	14 years professional experience	Realty Specialist
Robert Epp	B.S. Range Management; 18 years professional experience	Range Conservation, Livestock Grazing
Susan Foley	B.S. Range Management; 6 years professional experience	Soils and Watershed
Walt George	M.S. Ecology, B.S. Wildlife Management; 18 years professional experience	Realty Specialist

Table 6.2 (Continued)

Name	Education/Experience	EIS Responsibility
Fred Georgeson	B.S. Geology; 20 years professional experience	Geology and Mineral Resources
Martin Griffith	B.S. Renewable Resource Management; 15 years professional experience	Renewable Resources
Jack Kelly	B.S. Agronomy; 25 years professional experience	Multi-disciplinary
Larry Kmoch	B.S. Ranch and Range Management; 31 years professional experience	Team Leader
Gary Long	B.A. Geography; 21 years professional experience	Recreation, Visual Resources
Phyllis Michaud	A.A. Business; 25 years professional experience	Socioeconomics
Roger Miller	M.S. Geology, B.S. Geology; 30 years professional experience	Geology and Hydrology
Mark Newman	B.S. Geology; 17 years professional experience	Geology and Hydrology
Sue Oberlie	B.S. Wildlife Management; 8 years professional experience	Wildlife, Fisheries, T&E
Carl Santmyer	Ph.D. Economics; 25 years professional experience	Socioeconomics
Rick Schuler	B.S. Range Ecology; 20 years professional experience	Soil, Water, and Air Resources
Michael Stewart	B.S. Range Management; 13 years professional experience	Range and Riparian Resources
Bob Tigner	Ph.D. Environmental Biology, M.S. Wildlife Management, B.S. Game Management; 35 years professional experience	Management Representative/ Coordination

Table 6.2 (Continued)

Name	Education/Experience	EIS Responsibility
Brenda Vosika	B.S. Geological Engineering; 5 years professional experience	Mining Engineer
Ed Womack	B.S. Wildlife Management; 20 years professional experience	Minerals/Wildlife Specialist
MARIAH ASSOCIATES, INC.		
Karyn C. Classi	M.S. Botany, M.S. Geology, B.A. Geology; 12 years professional experience	Geology, Soils, Vegetation, Wetlands
Dennis Feeney	M.S. Geography; 4 years professional experience	Technician
Peter J. Guernsey	M.S. Range Management (pend.), B.S. Biology; 12 years professional experience	Project Management, Technical Coordinator, Project Description
William Harding	B.A. Anthropology, 10 years professional experience	Cultural Resources
Gary Heller	M.S. Zoology and Physiology, B.S. Wildlife Management; 8 years professional experience	Wildlife, T&E
Scott Kamber	B.S. Environmental Studies/Biology; 14 years professional experience	Socioeconomics, Land Use, Visual Resources
Craig L. Kling	M.S. Wildlife Biology, B.A. Ecology and Wildlife; 20 years professional experience	Quality Assurance
Russ Pickering	B.S. Zoology/Physiology; 8 years professional experience	Hazardous Materials
Tom Reust	B.S. Social Sciences; 13 years professional experience	Cultural Resources

Table 6.2 (Continued)

Name	Education/Experience	EIS Responsibility
Kim Rightmire	M.S. Watershed Science; 7 years professional experience	Physical Resources
Roger Schoumacher	M.S. Fisheries, B.S. Wildlife Management; 30 years professional experience	Quality Assurance
Craig S. Smith	M.A. Anthropology, B.A. Anthropology; 18 years professional experience	Cultural Resources
Jim States	Ph.D. Animal Ecology, M.S. Plant Ecology; 21 years professional experience	Quality Assurance
Diane Thomas	M.S. Zoology and Physiology, B.S. Wildlife Management, B.A. English; 6 years professional experience	Technical Editor

7.0 REFERENCES AND ABBREVIATIONS AND ACRONYMS

7.1 REFERENCES

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7.2 ABBREVIATIONS AND ACRONYMS

3C	Category 3 Candidate Species
AGP	acid generation potential
ANP	acid neutralization potential
AO	Authorized Officer
AUM	animal unit month
BLM	Bureau of Land Management
BTU	British thermal unit
°C	degrees Celsius
C1	Category 1 Candidate Species
C2	Category 2 Candidate Species
$CaCO_3$	calcium carbonate
CAS	Chemical Abstract Service registry number
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CFR	Code of Federal Regulations
cm/sec	centimeter(s) per second
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
dBA	A-weighted decibel
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMT	Emergency Medical Technician
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right to Know Act
ER	Environmental Report
°F	degrees Fahrenheit
FLPMA	Federal Land Policy and Management Act
ft^3	cubic feet
ft/day	feet per day
gal	gallons
GDRA	Great Divide Resource Area
GMMV	Green Mountain Mining Venture
gpm	gallons per minute
HCO_3	bicarbonate
HMA	herd management area
HMS	Hazardous Materials Summary
I-80	Interstate Highway 80
IDT	interdisciplinary team
Kennecott	Kennecott Uranium Company
KPH	Kea Pacific Holdings Inc.
kV	kilovolt
lb(s)	pound(s)
lbs/acre	pounds per acre
LOP	Life-of-Project
LRA	Lander Resource Area

Mariah	Mariah Associates, Inc.
mCi	millicurie(s)
$\mu g/m^3$	micrograms per cubic meter
meq/l	milliequivalents per liter
mg/l	milligrams per liter
mg/l CO_3	milligrams of carbonate per liter
mg/l HCO_3	milligrams of bicarbonate per liter
mph	mile(s) per hour
mrem	millirems
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standard
n.d.	no date or no data
NEPA	National Environmental Policy Act of 1969
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NPDES	National Pollution Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	ozone
ORV	off-road vehicle
PAHs	polynuclear aromatic hydrocarbons
Pb	lead
PCB	polychlorinated biphenyl
pCi/l	picocuries per liter
PLS/acre	pounds pure live seed/acre
PM_{10}	fine respirable particulate matter less than 10 micrometers in diameter
POM	polycyclic organic matter
ppb	parts per billion
ppm	parts per million
PSD	prevention of significant deterioration
RCRA	Resource Conservation and Recovery Act
RMP	Resource Area Management Plan
ROD	Record of Decision
ROW	right-of-way
RV	recreational vehicle
SARA	Superfund Amendments and Reauthorization Act
SCS	U.S. Soil Conservation Service
SHPO	Wyoming State Historic Preservation Office
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPCCP	Spill Prevention Control and Countermeasure Plan
SPPP	Stormwater Pollution Prevention Plan
s.u.	standard units
T&E	threatened and endangered species
TDS	total dissolved solids
tpd	tons per day

tpy	tons per year
TSP	total suspended particulates
TSS	total suspended solids
TV	television
U_3O_8	uranium oxide
umhos/cm	microohms per centimeter
UP	Union Pacific
USDI	U.S. Department of the Interior
USDOC	U.S. Department of Commerce
USE	U.S. Energy Corporation/Crested Corporation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
WDAF	Wyoming Department of Administration and Information
WDC	Wyoming Department of Commerce
WDEQ	Wyoming Department of Environmental Quality
WDEQ-AQD	Wyoming Department of Environmental Quality-Air Quality Division
WDEQ-LQD	Wyoming Department of Environmental Quality-Land Quality Division
WDEQ-WQD	Wyoming Department of Environmental Quality-Water Quality Division
WDH	Wyoming Department of Health
WDR	Wyoming Department of Revenue
WESC	Wyoming Employment Security Commission
WGFD	Wyoming Game and Fish Department
WNDDB	Wyoming Natural Diversity Database
WOGCC	Wyoming Oil and Gas Conservation Commission
WSEO	Wyoming State Engineer's Office
$yd(s)^3$	cubic yard(s)

APPENDIX A:

HAZARDOUS MATERIALS SUMMARY

HAZARDOUS MATERIALS SUMMARY
FOR THE
GREEN MOUNTAIN MINING VENTURE
JACKPOT MINE PROJECT

Prepared for

Lander Resource Area
Rawlins District
Bureau of Land Management
Rawlins, Wyoming

By

Mariah Associates, Inc.
Laramie, Wyoming
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June 1995

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1.0 INTRODUCTION

GMMV proposes to develop an underground uranium mine (i.e., the Jackpot Mine), on the southern side of Green Mountain, 14 miles southeast of Jeffrey City in Fremont County, Wyoming. The BLM has prepared an EIS for the proposed project, and this HMS is included as an appendix to the EIS, and provides further specific information regarding the types and quantities of hazardous and extremely hazardous materials that would be produced or used for the proposed project. Detailed descriptions of the Proposed Action and alternatives, the potential environmental consequences, and the proposed mitigation and monitoring measures are provided in the EIS.

This HMS is provided pursuant to BLM Instruction Memoranda (Nos. WO-93-344, WY-94-059, WY-94-081, 94-253, and WY-04-94-24) and Information Bulletins (WY-94-419), which require that all NEPA documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of proposed project activities (personal communication, February 2, 1995, with Marty Griffith, Hazardous Material Specialist, BLM State Office). Hazardous materials, as defined herein, are those substances listed in the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986,* and extremely hazardous materials are those identified in the EPA's *List of Extremely Hazardous Substances* (40 CFR 355). Materials identified on either of these lists that would be used or produced by the proposed project are discussed below.

A list of hazardous and extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of the proposed project was obtained from GMMV, along with Material Safety Data Sheets (MSDS) for all chemicals, compounds, and/or substances that may be used during the development, operation, or reclamation of the proposed project. GMMV has identified the type and quantity of all hazardous materials that would be potentially used or produced by the proposed project. No unauthorized use or disposal of these materials would occur as a result of this project, and all project personnel would be directed to dispose of these materials in an appropriate manner (e.g., per manufacturer's or regulatory agency guidelines). Solid wastes generated during the proposed project would be collected in approved waste facilities (e.g., dumpsters) and regularly transported to an approved disposal facility.

2.0 HAZARDOUS MATERIALS

A listing of known hazardous and extremely hazardous materials that may be used, produced, stored, transported, or disposed of during project implementation is provided herein. Where possible, the annual required quantities of these materials have been estimated, and their use, storage, transport, and disposal methods have been defined. A summary of potentially applicable state and federal regulatory requirements for these materials is also provided, where appropriate.

2.1 PRODUCTION PRODUCTS

The purpose of the proposed project is to extract uranium ore from Green Mountain. The uranium resource occurs as sandstone-hosted uraninite and coffinite and is found in multiple flat-lying layers over an elevational range of approximately 1,000 feet, about 2,500 to 3,500 feet beneath the surface of Green Mountain. Substances potentially produced from the exploration project include uranium ore, mine water, and mine waste rock. Table A.1 lists the hazardous and extremely hazardous materials that may be found in these materials.

2.1.1 Uranium Ore

Uranium ore, primarily containing uraninite and coffinite, would be produced from the proposed mining operation at rates averaging 3,000 tons per day (tpd). Radioactive isotopes known to exist in uranium ore from this area include radium 226 and 228 (Table A.1). Ore extracted from the mine would initially be stockpiled on the surface within the WDEQ-LQD mine permit area and then transported approximately 37 miles via covered trucks along existing roads to Sweetwater Uranium Mill.

2.1.2 Mine Water

The GMMV estimated maximum mine-water discharge rate would be 732 gallons per minute (gpm). Hazardous and extremely hazardous materials potentially present in mine water produced from the proposed project include aluminum, ammonia (an extremely hazardous waste), arsenic, barium, cadmium, chromium, copper, lead, manganese, mercury, nickel, radium 226 and 228, selenium, uranium, and zinc (Table A.1). Mine-water settling basins, ponds, and treatment facilities would initially be designed and constructed to accommodate 1,300 gpm, and additional basins, ponds, and treatment facilities would be constructed as necessary.

Mine-water quality would be monitored as identified in the Jackpot Mine Permit Application (GMMV 1994), and these water-quality data would be used to determine whether water treatment is necessary prior to discharge. A NPDES permit (WY-0033952) has already been issued to GMMV under License to Explore 179LE. If mine-water treatment is required, a separate treatment facility would be constructed at the proposed mine site. An ion exchange unit (i.e., closed vessels containing ion exchange resin) and barium/radium sulfate precipitation process (see Section 2.2.6) would be utilized as necessary for water treatment. Once an ion exchange unit is full, loaded resins would be temporarily stored at the mine site and eventually transported to the Sweetwater Mill for processing. Barium/radium sulfate precipitates would be covered with suitable materials and buried in place, or disposed of at an alternate WDEQ-approved and permitted location.

2.1.3 Mine Waste Rock

Mine waste rock would be extracted during the mining of the uranium ore. Radioactive isotopes known to exist in uranium from this area and which may be found in the mine waste rock include radium 226 and 228. The volume of mine waste rock potentially produced during the LOP is estimated at 2.8 million yds^3 of material. Under the Proposed Action and Alternatives A, B, and C, the mine waste rock pile would be located and isolated in No Name drainage within the WDEQ-LQD mine permit area and would cover approximately 37 acres. Under Alternative D,

Table A.1 Hazardous and Extremely Hazardous Materials Potentially Produced by GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Production Product	Hazardous Constituents[1]	CAS Number[2]	Approximate Quantity Produced Per Year[3]
Uranium ore[4]	--	--	1,000,000 tons
	radium 226 and 228	--	n.d.
	uranium	--	4,000,000 lbs
Mine water[5]	--	--	767.2 acre ft
	aluminum	7429-90-5	324-74,994 lbs
	ammonia[6]	7664-41-7	65-52,044 lbs
	arsenic	7440-38-2	3-869 lbs
	barium	7440-39-3	97-1,617 lbs
	cadmium	7440-43-9	6-16 lbs
	chromium	7440-47-3	65-226 lbs
	copper	7440-50-8	324-2,263 lbs
	lead	7439-92-1	65-2,780 lbs
	manganese	7439-96-5	808-38,790 lbs
	mercury	7439-97-6	3 lbs
	nickel	7440-02-0	33-126 lbs
	radium 226 and 228	--	0-8.3 mCi
	selenium	7782-49-2	3-16 lbs
	uranium	--	0.0065-1.1 lb
	zinc	7440-66-6	33-9,471 lbs
Mine waste rock	--	--	14,000 tons
	arsenic	7440-38-2	<161 lbs
	copper	7440-50-8	289 lbs
	lead 210	--	<0.0027 mCi
	radium 226	--	<0.0021 mCi
	selenium	7782-49-2	<11.1 lbs
	thorium 230	--	<0.0002 mCi
	uranium	--	31 lbs

---

[1] The hazardous constituents listed are those that are known to be, or may be, present in the production materials and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended.

[2] CAS Number = Chemical Abstract Service registry number.

[3] gal = gallon
lbs = pounds
mCi = millicurie
n.d. = no data

[4] Annual quantity assumes 3,000 tons of ore would be generated per day.

[5] Annual quantity assumes 470 gallons of mine water would be generated per minute; annual quantities of mine-water constituents were calculated from groundwater sampling data presented in Section 3.1.5.2 of the EIS.

[6] Extremely hazardous materials as defined in 40 CFR 355.

mine waste rock would be disposed of in an existing pit at the Big Eagle Mine. Upon project completion, the waste rock pile would be appropriately covered with suitable materials (e.g., topsoil) and revegetated.

2.2 CONSTRUCTION, OPERATION, AND RECLAMATION

Known hazardous and extremely hazardous materials planned for use during construction, operation, and reclamation of the proposed project are listed in Table A.2 and are described in detail below. Hazardous and extremely hazardous material sources planned for use during the proposed project are categorized as follows:

- cement and shotcrete,
- coolant/antifreeze,
- explosives,
- fuels,
- lubricants,
- water treatment, and
- miscellaneous materials.

2.2.1 Cement and Shotcrete

Cement (300 yds^3 for the LOP) and shotcrete (200 yds^3 for the LOP) will serve as construction materials for the portals and foundations at the proposed mine site (Table A.2). Materials potentially used for cementing and shotcreting operations include cement, calcium hydroxide, calcium chloride, pozzolan, sodium bicarbonate, potassium chloride, and insulating oil. Cement, shotcrete, and additives used on-site may contain the hazardous material classes of fine mineral fibers, polycyclic organic matter (POM), and polynuclear aromatic hydrocarbons (PAHs). No extremely hazardous materials are known to be present in the cement, shotcrete, and additives proposed for use by this project. All cement and shotcrete used for the proposed project would be stored and used within the Jackpot Mine permit area or at the Big Eagle facilities site.

2.2.2 Coolant/Antifreeze

Coolant/antifreeze would be utilized for combustion engines associated with construction, mine operations, and ore transportation (Table A.2). Ethylene glycol is the principle hazardous material present in coolant/antifreeze; no extremely hazardous materials are known to be present. Approximately 220 gal of coolant/antifreeze would be utilized per year in on-site mining machinery and ore transport vehicles. Coolant/antifreeze would be stored at the Big Eagle Mine, and total storage would not exceed 4,000 gal at any time.

2.2.3 Explosives

Prill (6,000 lbs/yr) and dynamite (600 lbs/yr) would be utilized during mining operations to facilitate the removal of mine waste rock materials and the extraction of the uranium ore. Hazardous materials present in these explosives include ammonium nitrate and diesel fuel (prill) and nitroglycerin (dynamite); no extremely hazardous materials are known to be present in prill and dynamite (Table A.2). These explosives would be stored at the Jackpot Mine site, and total storage would not exceed 40,000 lbs of prill and 10,000 lbs of dynamite at any time.

2.2.4 Fuels

Gasoline, diesel fuel, and natural gas are the fuels proposed for use by the project, and all contain materials deemed hazardous (Table A.2). Gasoline would be used to power vehicles providing transportation to and from the mine (e.g., vans, pickup trucks). Diesel fuel would be used to power ore transport vehicles and construction equipment, and as a component of the explosive prill. Natural gas would be burned to produce heat.

Table A.2 Hazardous and Extremely Hazardous Materials Potentially Utilized During Construction, Operation, and Reclamation by the GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Source	Approximate Quantity Used Per Year[3]	Hazardous Constituents[1]	CAS Number[2]
CEMENT AND SHOTCRETE	20-23 yds^3	fine mineral fibers	--
		PAHs[4]	--
		POM[4]	--
COOLANT/ANTIFREEZE	220 gal	ethylene glycol	107-21-1
EXPLOSIVES			
Prill	6,000 lbs	ammonium nitrate	6484-52-2
		diesel (see below for constituents)	--
Dynamite	600 lbs	nitroglycerin	55-63-0
FUELS			
Gasoline	13,200 gal	benzene	71-43-2
		ethylbenzene	100-41-4
		methyl tert-butyl ether	1634-04-4
		m-xylene	108-38-3
		o-xylene	95-47-6
		PAHs[4]	--
		POM[4]	--
		p-xylene	106-42-3
		tetraethyl lead[5]	78-00-2
		toluene	108-88-3
Diesel	144,000 gal	benzene	71-43-2
		ethylbenzene	100-41-4
		methyl tert-butyl ethel	1634-04-4
		m-xylene	108-38-3
		naphthalene	91-20-3
		o-xylene	95-47-6
		PAHs[4]	--
		POM[4]	--
		p-xylene	106-42-3
		toluene	108-88-3
Natural gas	1,000,000 ft^3	hexane	110-54-3
		hydrogen sulfide[5] (600 ft^3)	7783-06-4
		PAHs[4]	--
		POM[4]	--

Table A.2 (Continued)

Source	Approximate Quantity Used Per Year[3]	Hazardous Constituents[1]	CAS Number[2]
LUBRICANTS (i.e., motor oils, transmission fluids, and miscellaneous lubricants and greases)	3,120 gal	barium	7440-39-3
		cadmium	7440-43-9
		copper	7440-50-8
		lead	7439-92-1
		manganese	7439-96-5
		nickel	7440-02-0
		PAHs[4]	--
		POM[4]	--
		zinc	7440-66-6
WATER TREATMENT			
Ion exchange resin	200 ft^3	n.d.	--
Barium/radium sulfate precipitate	1,000 ft^3	barium compounds (barium chloride)	--
		radium 226 and 228	--
MISCELLANEOUS HAZARDOUS MATERIALS			
Fertilizers and herbicides	400 lbs	n.d.	--
Paints	600 gal	barium	7440-39-3
		cobalt	7440-48-4
		lead	7439-92-1
		manganese	7439-96-5
		PAHs[4]	--
		POM[4]	--
		sulfuric acid	7664-93-9
Solvents	960 gal	acetone	67-64-1
		d-limeonene citrus terpine	5989-27-5
		hydrotreated light distillate	64742-47-8
		isopropyl alcohol (anhydrous)	67-63-0
		toluene	108-88-3

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[1] The hazardous constituents listed are those that are known to be, or may be, present in the utilized products and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended. Where possible, the annually required quantity of hazardous constituents is provided in parentheses. n.d. = no data

[2] CAS Number = Chemical Abstract Service registry number.

[3] ft^3 = cubic feet, gal = gallon, lbs = pounds, yds^3 = cubic yards.

[4] PAHs = polynuclear aromatic hydrocarbons, POM = polycyclic organic matter.

[5] Extremely hazardous material as defined in 40 CFR 355.

2.2.4.1 Gasoline

Approximately 13,200 gal of gasoline (7,200 gal of leaded; 6,000 gal of unleaded) would be required per year for the proposed project. Gasoline would be used exclusively as a fuel for transport vehicles and miscellaneous machinery powered by internal combustion engines. Hazardous materials present in gasoline include benzene, ethylbenzene, methyl tert-butyl ether, m-xylene, o-xylene, PAHs, POM, p-xylene, and toluene. Leaded gasoline also contains tetraethyl lead, which is listed as an extremely hazardous material (Table A.2); unleaded gasoline contains no extremely hazardous materials. Gasoline would be stored at the Big Eagle Mine, and storage would not exceed 13,000 gal at any time.

2.2.4.2 Diesel Fuel

Approximately 144,000 gal of diesel fuel would be required per year for the proposed project. Hazardous materials known to occur in diesel fuel include benzene, ethylbenzene, methyl tert-butyl ether, m-xylene, naphthalene, o-xylene, PAHs, POM, p-xylene, and toluene; no extremely hazardous materials are known to be present in diesel fuel. Diesel would be stored at the Big Eagle Mine, and total storage would not exceed 40,000 gal at any time.

2.2.4.3 Natural Gas

Approximately one million ft^3 of natural gas would be burned each year to provide heat for project facilities (e.g., buildings). Hazardous materials known to be present in natural gas include hexane, hydrogen sulfide (an extremely hazardous material), PAHs, and POM. Approximately 600 ft^3 of hydrogen sulfide would be generated each year from the combustion of natural gas. Natural gas would be routed to the project area by standard commercial gas lines; no on-site storage of natural gas is anticipated for the proposed project.

2.2.5 Lubricants

Various lubricants, including motor oils (1,200 gal/yr), transmission fluids (600 gal/yr), and miscellaneous lubricants and greases (1,320 gal/yr), would be utilized for project-required vehicles and machinery. Some of these lubricants would likely contain PAHs and POM, and some may additionally contain compounds of barium, cadmium, copper, lead, manganese, nickel, and zinc. No extremely hazardous materials are known to be present in the lubricants required for the proposed project. All lubricants would be stored at the Big Eagle Mine, and total storage would not exceed 24,000 gal at one time. Lubricants would be used, stored, transported, and disposed of following manufacturer's guidelines; no unauthorized disposal of lubricants (e.g., disposal of used motor oil) would occur as a result of project or project-related activities.

2.2.6 Water Treatment Materials

2.2.6.1 Ion Exchange Resin

The removal of uranium and other potential elements of concern from mine water would be accomplished by an ion exchange unit; this unit would consist of several skid-mounted, closed vessels filled with an ion-exchange resin (DOW 21K). No hazardous or extremely hazardous materials are known to occur in this resin. Approximately 200 ft^3 of resin per year would be required for project operations. This resin would be stored at the Jackpot Mine Permit Area, and storage would not exceed 1,500 ft^3 at any time. Once the resin in a vessel becomes full, the loaded resin would be transported to the Sweetwater Mill for processing. After processing at the mill, the "barren" resin would be transported back to the mine site and reinstalled for further use.

2.2.6.2 Barium/Radium Sulfate Precipitate

Removal of radium 226 from mine water would be accomplished by the addition of barium chloride to form an insoluble precipitate of barium sulfate with which radium 226 co-precipitates. Approximately 36,500 lbs of barium chloride per year would be required by the proposed project; total storage of barium chloride at the Jackpot Mine Permit Area would not exceed 40,000 ft^3 at any given time. Approximately 1,000 ft^3 of barium/radium sulfate precipitate would be produced per year (i.e., 20,000 ft^3 for the LOP), and hazardous materials associated with mine water may also be present in the sludge. Precipitates would settle out in a lined retention pond of sufficient size to allow for adequate precipitation of the barium/radium sulfate; the retention pond would be located within the WDEQ-LQD Jackpot Mine Permit Area.

2.2.7 Miscellaneous Hazardous Materials

Miscellaneous materials, potentially containing hazardous and/or extremely hazardous materials, that may be used for the proposed project include fertilizers, herbicides, paints, and solvents. Fertilizers and herbicides would be utilized during reclamation, and herbicides may also be used during project activities to control weed infestation around project facilities. Various paints would be utilized for buildings and other mine-related facilities. Solvents (e.g., paint thinner) would have multiple uses during facility construction, as well as for machine operation and maintenance activities. All use, transportation, storage, and disposal of fertilizers, herbicides, paints, and solvents would follow manufacturer's guidelines and would adhere to all applicable state and federal guidelines.

2.2.7.1 Fertilizers and Herbicides

Approximately 200 lbs of fertilizers and 200 lbs of herbicides would be used per year, and these compounds would likely contain hazardous and/or extremely hazardous materials. The types of fertilizers and herbicides proposed for use are not known at this time; however, their use, storage, transport, and disposal would be consistent with manufacturer's guidelines.

2.2.7.2 Paints

Approximately 600 gal/year of various paints would be utilized for the proposed project. These paints may contain the following hazardous materials: barium, cobalt, lead, manganese, PAHs, POM, and sulfuric acid. Paints would be stored in appropriate containers at the Big Eagle Mine, and storage would not exceed 600 gal at any time. GMMV would use water-soluble paints where possible.

2.2.7.3 Solvents

Approximately 960 gal of solvents (i.e., 660 gal of various cleaning solvents and 300 gal of paint thinner) would be utilized per year during the proposed project. Hazardous materials known to occur in these solvents include acetone, d-limeonene citrus terpine, hydrotreated light distillate, isopropyl alcohol (anhydrous), and toluene. Solvents would be stored at the Big Eagle Mine in appropriate containers, and total storage would not exceed 110 gal (general solvents) and 25 gal (paint thinner) at any time.

2.3 EMISSIONS

Emission of hazardous and extremely hazardous materials would occur due to mine ventilation, fugitivie dust, and vehicle operation during the proposed project. Hazardous and extremely hazardous substances associated with these emissions are listed in Table A.3.

2.3.1 Mine Ventilation and Fugitive Dust

Ventilation from the mine would release radon, particulate matter (i.e., fugitive dust from mining operations), and combustion emissions. The annual amount of radon that would be emitted from the mine is unknown, but would not exceed 10 mrem/year at the nearest sampling receptor location. Hazardous materials present in

Table A.3 Hazardous and Extremely Hazardous Materials Potentially Present in Combustion Emissions of the GMMV Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming, 1995.

Emission	Hazardous Constituents[1]	CAS Number[2]
Hydrocarbons	PAHs[3]	--
	POM[4]	--
Particulate matter	aluminum	7429-90-5
	arsenic	7440-38-2
	barium	7440-39-3
	cadmium	7440-43-9
	chromium	7440-47-3
	copper	7440-50-8
	fine mineral fibers	--
	lead	7439-92-1
	manganese	7439-96-5
	mercury	7439-97-6
	nickel	7440-02-0
	radium 226	--
	radium 228	--
	selenium	7782-49-2
	uranium	--
	zinc	7440-66-6
Gases	nitrogen dioxide[5]	10102-44-0
	ozone[5]	10028-15-6
	radon 220	--
	radon 222	--
	sulfur dioxide[5]	7446-09-5
	sulfur trioxide[5]	7446-11-9

---

[1] The hazardous constituents listed are those that are known to be, or may be, present in the potential emissions and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization (SARA) of 1986*, as amended.

[2] CAS Number = Chemical Abstract Service registry number.

[3] PAHs = polynuclear aromatic hydrocarbons.

[4] POM = polycyclic organic matter.

[5] Extremely hazardous materials are those defined in 40 CFR 355.

particulate matter would probably be similar to those in the mine waste rock (see Section 2.1.3). Hazardous materials present in combustion emissions are discussed in Section 2.3.2. Although the quantity of particulate matter and combustion emissions released through mine ventilation is unknown, releases of these emissions would not exceed allowable levels for PSD Class II areas or under relevant WDEQ-AQD Implementation Plans, nor would releases occur that jeopardize NAAQS for the area.

2.3.2 Combustion Emissions

Combustion emissions from gasoline and diesel engines would occur as a result of this project. Unburned hydrocarbons, particulate matter (e.g., carbon, metallic ash), carbon monoxide, nitrogen oxides, and possibly sulfur oxides would be expected as direct exhaust contaminants (Table A.3). Secondary contaminants would likely include the formation of ozone from the photolysis of nitrogen oxides.

Unburned hydrocarbons may contain potentially hazardous PAHs, and particulate matter may contain metal-based particulates from lead anti-knock compounds in the fuel, metallic lubricating oil additives, and engine wear particulates (Table A.3). Therefore, hazardous materials in the particulate matter may include compounds of barium, cadmium, copper, lead, manganese, nickel, and zinc.

Nitrogen dioxide, sulfur dioxide, sulfur trioxide, and ozone are probable combustion emissions; all are classified as extremely hazardous materials. These materials would be either directly released in minor quantities from internal combustion engines, or would be formed through photolysis (i.e., ozone). Particulate matter emissions and larger unburned hydrocarbons would eventually settle out on the ground surface, whereas gaseous emissions would react with other air constituents as components of nitrogen, sulfur, and carbon cycles.

3.0 MANAGEMENT POLICY AND PROCEDURE

GMMV would ensure that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials associated with the proposed project would be in strict accordance with all applicable existing, or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All project-related activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials would be conducted in such a manner as to minimize potential environmental impacts.

GMMV would comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of reportable quantities, as established in 40 CFR 117, would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980*, as amended. The materials for which such notification must be given are the extremely hazardous substances listed under the *Emergency Planning and Community Right to Know (EPCRA)* Section 302 and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice of the release would be given to the BLM's AO and all other appropriate federal and state agencies. Additionally, notice of any spill or leakage (i.e., undesirable event), would be immediately given by GMMV to the AO and other such federal and state officials as are required by law.

GMMV has evaluated field operations in the project area and has or would prepare and implement multiple plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies shall be available for review at the BLM LRA in Lander. These plans/policies include:

- SPCCP for the proposed Jackpot Mine and associated facilities;
- inventories of hazardous chemical categories pursuant to Section 312 of the SARA, as amended; and
- Emergency Response Plans.

Development operations would be in compliance with regulations promulgated under the RCRA, Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Occupational Safety and Health Act, and the Federal Clean Air Act. In addition, project operations would comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

APPENDIX B:
RECLAMATION PLAN

RECLAMATION PLAN
FOR THE
GREEN MOUNTAIN MINING VENTURE
JACKPOT MINE PROJECT

Prepared for

Lander Resource Area
Rawlins District
Bureau of Land Management
Rawlins, Wyoming

By

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Laramie, Wyoming
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June 1995

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RECLAMATION PLAN

1.0 OBJECTIVES AND GOALS

All disturbed lands will be reclaimed to a condition equal to or better than the predisturbance status. The specific goal of reclamation is to develop self-sustaining native vegetation communities that meet or exceed premining parameters for cover, production, and diversity. Other goals include the development of a geologically and hydrologically stable landform that meets future land uses. Land uses after mining will be identical to premining uses, and will include livestock grazing, wildlife habitat, recreation, mineral exploration, and timbering.

Reclamation will utilize various techniques to accomplish:

- a stable landform that will minimize soil erosion and allow continued land uses;
- plant cover, production, and diversity comparable to premining conditions;
- self-perpetuating vegetation consisting of native species; and
- protection of surface and groundwater resources for possible future use.

2.0 AFFECTED COMMUNITIES

Three plant community types--sagebrush, dunal, and riparian--will be disturbed. Disturbance caused by actual mining operations and roads will primarily affect the sagebrush plant community. The sediment pond and dam located below the mine waste rock pile will affect a small area of riparian vegetation. Roads will also affect a very small amount of dunal and riparian plant communities.

3.0 TEMPORARY RECLAMATION PLAN

Temporary reclamation will occur on areas that later will be disturbed by final mine reclamation activities. Disturbed areas subject to temporary reclamation include topsoil and subsoil piles, road cut-and-fill areas, and pond and ditch banks and sideslopes. Temporary reclamation activities will reduce soil loss due to wind and water erosion, and will stabilize slopes and reduce the chances of slope failure.

Upon completion of the specific construction activity, disturbed areas will be graded and contoured as required to provide a suitable seedbed. Other seedbed preparation activities such as disking or ripping, to reduce soil compaction may also be required. The area will be seeded at the first appropriate opportunity using the Temporary Seed Mixture (Table B-1). Areas that have been seeded will be visually monitored for seedling establishment, and will be reseeded until establishment is satisfactory.

4.0 PERMANENT RECLAMATION PLAN

Reclamation will be required on all disturbed areas, including roads, mine declines, portals and vents, utilities, buildings and structures, wells, mine rock pile, and sedimentation and treatment ponds. The following discussion provides a sequential description of the various activities associated with the mine reclamation.

4.1 FACILITY AND STRUCTURE REMOVAL AND CLOSURE

All buildings and structures, including the electrical power substation, water treatment facilities, energy-dissipating structures, and associated hardware, will be dismantled and removed from the site after mining has ceased. Any concrete foundations will be covered or removed and the area will be recontoured.

Reclamation of roads will be conducted as deemed appropriate by the BLM; some roads may remain after project completion. Road reclamation will begin with the removal of culverts, cattleguards, and signs. Drainage crossing sideslopes will be reduced to no more than 4:1 to reduce bank erosion and produce stable sideslopes. All

Table B-1 Reclamation Species List and Approximate Seeding Rates.

Species		PLS/Acre
Cover Crop Seed Mixture		
Winter wheat (*Triticum aestivum* var. Trapper)		50
Annual ryegrass (*Elymus* sp. var. Tetrablend)		25
	Total	75
Temporary Seed Mixture		
Western wheatgrass (*Elymus smithii* var. Rosana)		4.00
Slender wheatgrass (*Elymus trachycaulum* var. Revenue)		4.00
Streambank wheatgrass (*Elymus riparium* var. Sodar)		4.00
Wild blue flax (*Linum lewisii*)		0.25
Winter wheat (*Triticum aestivum* var. Trapper)		20.00
	Total	32.25
Permanent Species		
Indian ricegrass (*Oryzopsis hymenoides* var. Paloma)		2
Thickspike wheatgrass (*Elymus dasystachyum* var. Critana)		4
Streambank wheatgrass (*Elymus riparium* var. Sodar)		4
Western wheatgrass (*Elymus smithii* var. Rosana)		4
Slender wheatgrass (*Elymus trachycaulum* var. Revenue)		4
Bluebunch wheatgrass (*Elymus spicatum* var. Secor)		4
Green needlegrass (*Stipa viridula* var. Lodorm)		3
Idaho fescue (*Festuca idahoensis*)		3
Hard fescue (*Festuca ovina* var. Durar)		1
Basin wildrye (*Elymus cinereus* var. Magnar)		3
Wild blue flax (*Linum lewisii*)		1
Smooth brome (*Bromus inermis*)		3
Bitterbrush (*Purshia tridentata*)		1
Limber pine (*Pinus flexilis*)		1
Winterfat (*Krascheninnikovia lanata*)[2]		1
Scarlet globemallow (*Sphaeralcea coccinea*)[2]		1
	Total	40

[1] PLS/acre = pounds of pure live seed per acre.
[2] Added for BLM road reclamation seed mixture.

road-surfacing material (e.g., gravel) and excess roadfill material will be removed, and will either be blended into the existing topography or returned to the mine.

Water wells and any holes drilled for the purpose of exploration or mine development will be backfilled to total depth with bentonite. A 5-foot concrete plug will be inserted into the top of the hole, and the site will be graded and seeded. All well and drill holes will be reclaimed pursuant to WDEQ-LQD specifications (WDEQ-LQD 1993).

All on-site utilities will be installed by individual service companies which are responsible for obtaining separate BLM ROWs. The respective service companies will abandon and reclaim any disturbance created by access routes, poles, lines, trenches, and pipelines, according to the BLM specifications. Any GMMV-installed utility lines will be removed or abandoned in accordance with BLM and/or WDEQ-LQD regulations.

Upon closure of the mine, steel, concrete, and rock bolts in the portals will remain in place and 100 linear feet of each decline will be sealed by filling with compacted mine rock material. The portal surface areas will be backfilled a minimum of 100 feet from the face and will have a maximum slope of 3:1. Additional overburden will be placed over the area and graded and contoured to blend with adjacent topography. This backfilling of surface openings will reduce the possibility of long-term mine subsidence in the areas above and adjacent to these openings.

Liners in mine treatment impoundments will be disposed of according to applicable state and federal regulations. Pond bottoms will be sampled and analyzed for radium 226, uranium, and spent barium chloride. If such materials are found, they will be removed and disposed of according to state and federal regulations. This may require that the materials be taken to a uranium ore processing facility or removed to the underground mine. Small settling basins constructed within the mine for the purpose of holding and treating mine discharge water will be tested for radioactive material in a similar manner. The sedimentation basin constructed below the mine rock pile will be removed after all reclamation operations at the mine have been completed and after the reclamation bond held by WDEQ-LQD has been released. WDEQ-LQD and BLM approval will be obtained prior to the removal of the sedimentation basin.

The ore taken from the mine will be transported to the existing permitted Sweetwater Uranium Mill owned by GMMV and operated under NRC Source Materials License #SUA1350. The NRC license has specific provisions regarding the decommissioning and reclamation of the mill site, and reclamation of the Sweetwater Uranium Mill facility will follow these provisions.

4.2 BACKFILLING AND GRADING

All areas disturbed by mining facilities or operations will be backfilled and graded as soon as possible after operations have been completed. Backfilling and grading will blend cut-and-fill slopes with adjacent undisturbed areas while minimizing slope length, improving stability, reducing runoff, and decreasing erosion. Grading will provide a relatively smooth surface to facilitate the replacement of a uniform depth of topsoil. Grading will incorporate one or more of the following specialized techniques: slope rounding, bench grading, stair-step grading, contour furrowing, and/or berm placement on top of cut or filled slopes. Backfilling and grading operations will generally be accomplished with dozers and/or blades. Equipment selection will be determined based on the specific site and material to be graded, size of the area, on-site operating conditions, and equipment availability.

Mine waste rock material removed from the mine will be placed in the mine waste rock pile. This material may have a wide range of chemical and physical properties, some of which are unsuitable for plant growth. Upon completion of grading, the rock pile surface will be sampled to a depth of four feet on the basis of one sample location per acre. Samples will be analyzed according to

WDEQ-LQD Guideline No. 1 (WDEQ-LQD 1984a), and the results of this sampling program will be provided to the WDEQ-LQD and BLM. If unsuitable material is located, its extent will be determined, and the material either will be returned to the mine or covered with a minimum of four feet of suitable material.

All impoundments, basins, and ponds will be backfilled with material originally excavated from the site. If excess cut material has been transported off-site, suitable fill material will be brought in to allow the area to be recontoured and graded to blend with the existing topography.

Heavily compacted areas such as roads and equipment parking areas will be ripped or disked to a depth of approximately two feet to reduce compaction and improve water and root penetration. Ripping or disking will be accomplished with a dozer, blade, or tractor using an appropriate attachment. Disk blades or ripper shanks will be set approximately 12 inches apart. Waterbars will be installed on reclaimed roads as necessary to control topsoil erosion.

4.3 TOPSOIL REPLACEMENT

Topsoil salvaged from the road and mine areas during construction will be uniformly distributed on the area to be reclaimed using a scraper and/or dozer as appropriate for the material and site. Topsoil replacement will be scheduled for completion immediately prior to seeding to maximize seeding effectiveness and seedling establishment. If topsoil replacement is completed during spring, and seeding is delayed until fall, a suitable cover crop (Table B-1) will be broadcast or drill seeded for soil stabilization and weed control.

4.4 REVEGETATION PRACTICES

Reclaimed areas will be seeded using specific native species at rates identified in Table B-1. Seeding rates may vary depending on final seed mixtures and estimated seeding efficacy. Total PLS/acre will not be less than 20 pounds and may be as much as 40 pounds, depending on the seeding technique. Seeding generally will be done in the fall; however, some areas, such as critical locations or temporary storage sites, may be seeded in the spring.

Seeding techniques will be selected to optimize revegetation of sites and utilization of equipment. Generally, drill seeding will be accomplished using a Rangeland drill. When drill seeding is not practical due to steep slopes or wet soil conditions, broadcast seeding will be employed. Broadcast seeding will be accomplished either by hand or specialized broadcast seeders. Bitterbrush and limber pine may be drill seeded, broadcast, or planted as containerized stock, depending on the quality and quantity of available adapted plant materials and on-site conditions. Following seeding, selected areas with a high potential for erosion will be mulched with native grasses.

The recommended species list in Table B-1 includes species for winter use by wildlife. Sagebrush is not included in this mix because the linear disturbance of the road is bordered on both sides by sagebrush, and the lee slope of the waste pile has an upwind sagebrush seed source. These reclaimed areas likely will be provided with adequate supplies of sagebrush seed by natural means.

All possible efforts will be made to promote successful revegetation through appropriate livestock management practices; however, temporary fencing may be necessary to protect new vegetation. If fencing is necessary, smooth electric wire fence may be used; however, fencing efforts will be coordinated through the proper regulatory agency and fence designs will conform to WDEQ-LQD Guideline No. 10 (WDEQ-LQD 1979) and BLM guidelines.

Livestock and wildlife grazing can have a significant effect on vegetation re-establishment. However, weather will be the primary factor that determines when reclaimed areas can sustain grazing by livestock. As part of the reclamation success evaluation, GMMV will conduct specific studies to determine when reclamation success criteria have been met. Because the area is so small in comparison to the total BLM allotment, special grazing trials are not practical and will not be conducted following fence removal.

Road disturbance generally is linear in nature, and it is unlikely that excessive grazing will occur in these areas. Fencing of reclaimed road areas also could have an undesirable impact on big game and livestock movements through the area. Therefore, fences will not be installed on reclaimed roads.

Reclamation practices will conform to WDEQ-LQD and BLM rules and regulations. Any deviation from the WDEQ-LQD-approved reclamation plan (GMMV 1994) will be reviewed and approved by WDEQ-LQD before implementation. Reclamation practices are found in the reclamation sections of the GMMV mine permit application (GMMV 1994).

5.0 HYDROLOGIC RESTORATION

Groundwater restoration will begin during mining, with the identification of all aquifers intercepted during construction of the declines. If aquifers of differing water qualities are encountered in the declines, each major water-producing zone of differing water quality will be isolated during the reclamation phase of the operation to prevent commingling. This will be accomplished by backfilling and erecting low permeability barriers (bulkheads).

Surface water systems will be restored during final reclamation. Ephemeral channels that were cut off during mining will be restored and tied into downstream channels. The diversion ditch immediately above the mine site will remain as part of the final reclamation plan. This ditch will reduce erosion from the mine site area. The ditch is designed to safely pass the 100-year 6-hour storm event as specified in WDEQ-LQD regulations.

The GMMV will continue to monitor groundwater and surface water until the reclamation bond is released. The location, types of analyses, and frequency of sampling to be conducted will be determined after the WDEQ-LQD, BLM, and GMMV have evaluated mining impacts and mitigation success.

6.0 RECLAMATION SUCCESS

Final reclamation will begin within 180 days of mine closure. If economic conditions require a temporary halt of mining operations, a request for interim stabilization will be made in accordance with applicable WDEQ-LQD regulations.

Reclamation success will be determined by resampling vegetation transects initially established in 1987, and the establishment and sampling of new vegetation transects on newly reclaimed areas in accordance with WDEQ-LQD specifications (WDEQ-LQD 1993). Future sampling of existing and new vegetation transects will determine whether the following revegetation goals are met:

1. Postmining vegetation production and cover are comparable to premining conditions.
2. Species composition and diversity are capable of supporting postmining land uses, including grazing.
3. Vegetation parameters are sustained for two consecutive years.

Evaluation of reclamation success will follow parameters outlined in WDEQ-LQD Guideline No. 2 and Noncoal Rules and Regulations (WDEQ-LQD 1984b, 1993). An adequate reclamation bond is held by WDEQ-LQD and/or BLM to assure compliance with reclamation standards and will not be released until WDEQ-LQD and BLM are satisfied that reclamation goals and objectives have been met. At that time, vegetation protection fences and the last sediment control structures will be removed.

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